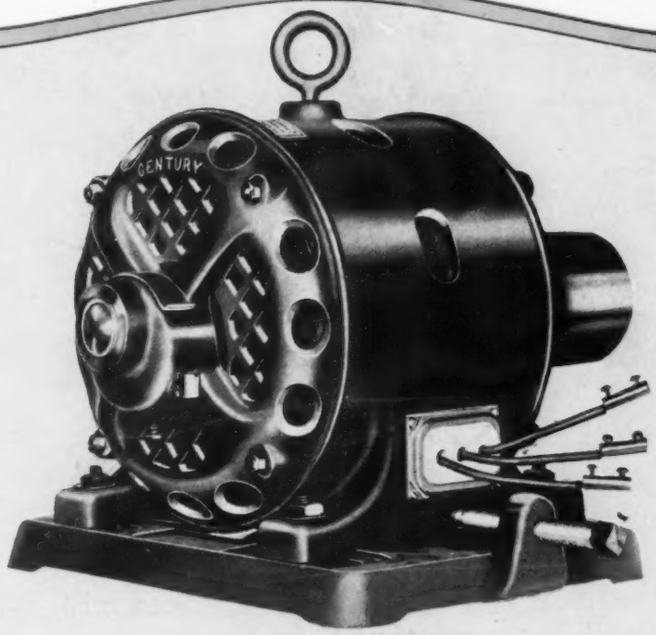
JUN 19 1922

Electrical World

McGraw-Hill Company, Inc. New York, June 17, 1922 Twenty-five Cents a Copy



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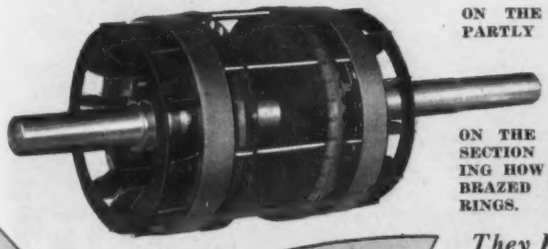
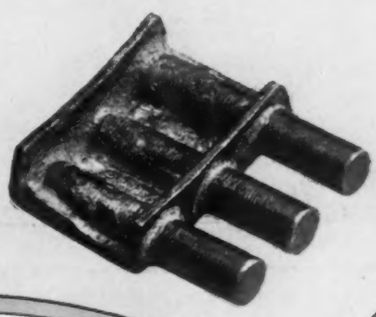


ON THE LEFT IS ILLUSTRATED PARTLY ASSEMBLED SQUIRREL CAGE ROTOR.

ON THE RIGHT IS ILLUSTRATED SECTION OF THE ROTOR SHOWING HOW THE COPPER BARS ARE BRAZED IN THE COPPER END RINGS.



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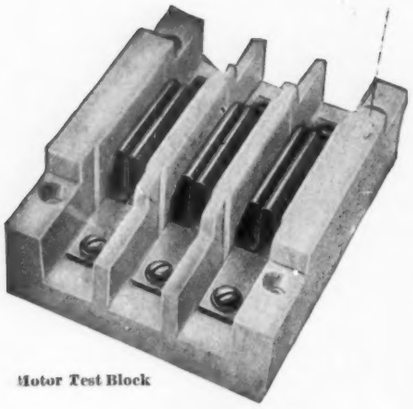

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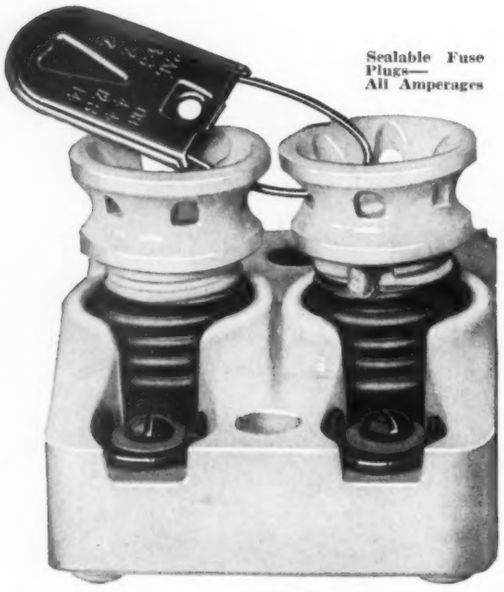

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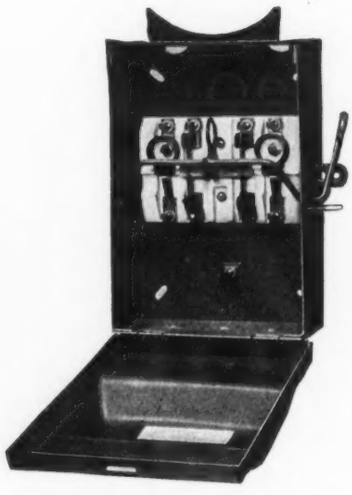

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.
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New York, Saturday, June 17, 1922

Volume 79 *Number* 24

Who Are "the Interests"?

RABID politicians and editors of yellow newspapers used to rave about "the interests" behind utility corporations. There had been plenty of selfish exploitation of public service franchises to provide material for campaign issues and political propaganda in many cities. But the cart-tail spellbinder and the men who plied the poison pens adopted it as universal gospel, good for any town and any time.

Out of the smoke and fire of all this spectacular headline and platform accusation came a general popular belief that utilities were owned by "interests." "Interests" were supposed to be groups of rich, greedy and dishonest men, banded together to rob communities by overcharging them for electric light or gas, or water or street-car rides. These rich men kept hidden out of sight and therefore were despicable.

THE reason sensible grown-up men and women swallowed all of this was because so many people said it so continuously in so many cities and because in some places it was proved to be true. And all the time the utilities in their towns did not prove to them that it was false. So, not knowing who did own their utilities, and not being told, they believed that there *were* hidden owners, that there must be a reason why they hid, and that the reason must be the same as in the other crooked cases.

So the politicians reared and pitched for personal reasons and the sensation editors wrote on and on. And the people kept wondering who it was who did own the utilities. The utility executives for some mysterious reason elected to sit still and suffer silently, when all that they had to do was to publish their stockholders' names to prove that as a matter of fact the people owned the utilities themselves.

If they had done this—if they would do it now—there would never be a word about "interests." For everybody knows that "we, the people"—all of us neighbors—are honest and never steal pennies from any one.

IT IS the duty of every man in any branch of the electrical industry to spread continuously a clear understanding of who it is who actually owns the electric utilities—and as a matter of fact all other large modern business enterprises as well. We own them, of course—we, the people—only we are allowed to forget. But the more electrical men talk about it, the less the politician can hinder and the more people will buy utility securities. And the more there are who are stockholders, the fewer there can be who will misunderstand.

Out of this understanding naturally will come more confidence, interest and enthusiasm for electrical appliances. And that, above all things, will promote the electrical industry.

Irving Edwin Moultrop

An engineer of national reputation in the field of central-station design and construction.

LACK of interest in the welfare of the profession as a whole and indifference to national aspects of engineering are two serious indictments to which many otherwise valuable men associated with technical industries must plead guilty. Conditions are changing for the better, however, and one of the chief causes is the leadership of engineers who have labored unremittingly along nationally constructive lines while carrying heavy individual responsibilities at home. These men speak with authority based upon solid achievement in day-to-day problems and upon their ability to escape the limitations of the local through their vision of what is attainable in the engineering world as a whole by co-ordinated professional activities.

In the person of the assistant superintendent of its construction bureau, the Edison Electric Illuminating Company of Boston has contributed an amazing total of good work on behalf of central-station engineering during the past thirty years. I. E. Moultrop's services to power-plant development, and especially to prime-mover progress, have been of exceptional character. The company's plant development is closely identified with the engineering leadership of the man, and this leadership transferred into national organizations has added to the reputation of both company and engineer. This does not mean that Mr. Moultrop has submerged his individuality for a moment; it does mean that he practices what he preaches and that his devotion to the cause of "reliability first, economy second," is the keynote of his engineering thinking both at home and abroad. He has never been led astray by the spectacular or the bizarre at the expense of service efficiency and has always borne in mind the quasi-public responsibilities of electric utilities in applying new ideas in design and equipment.

Mr. Moultrop was born in 1865 at Melrose, Mass. He served an apprenticeship in the Whittier Machine Company's shop at Roxbury, Mass., from 1883 to 1886, later becoming head draftsman. On Jan. 1, 1892, he was appointed chief draftsman of the Boston Edison company and in 1897 was made mechanical engineer. He was appointed to his present post in 1913. During this time he has had charge of station construction. The generating stations and substations of the system, the General Service Buildings of the company and many other of its engineering works bear his impress.

As former vice-president of the American Society of Mechanical Engineers, former chairman of its committee on increase of membership (which increased the enrollment from 4,000 to more than 8,000), representative of that society of the Engineering Foundation and on the American Engineering Council, member of the A. S. M. E. boiler code committee, of the power stations committee of the A. I. E. E. and of the committee on steam turbines and generators of the Association of Edison Illuminating Companies, past-chairman of the prime-movers committee and Technical Section of the N. E. L. A., representative of the N. E. L. A. on the American Engineering Standards Committee and on the advisory council of the federal government's Board of Surveys and Maps, and as a contributor to engineering publications and lecturer at technical institutions, Mr. Moultrop has served the engineering industry with zeal and ability.

Editorial Comment

Electrical World, June 17, 1922

Volume 79 Number 24

Bigger Men or a Bigger Job?

WE ASKED an official of one of the large operating companies recently what his sales managers were thinking about. He was just leaving for a sales managers' convention. When he came back he said: "They are not thinking. We sprang two or three fundamental propositions upon them without giving them advance notice, questions which they should have been considering for years. They made a sorry showing. There was no initiative, but apparently a complacent willingness to sit back and wait to be told step by step. Very few have the story back of public utility operation. They do not understand the underlying principles which formulate rates. They know too little of state commission supervision and nothing about the reasons why. They do not understand financing, and so on down the list." And this man has set himself to find the way to implant this fundamental knowledge.

It is a common weakness not only in the men who head the sales departments of central-station companies but in high executives themselves. But it is particularly costly in these commercial managers who maintain the contact between the company and the community. And the fault lies largely in the mistaken policy of not giving this function its proper recognition and making it the job of, say, a vice-president who *does* know the fundamentals of the business. Too long the central station has been content to select small-salaried men of small experience to head the commercial staff and conduct the sales, publicity and customer service operations, with all the influence that this work wields on the public and trade relations.

The manufacture and marketing of electric light, heat and power is a business and to be fully successful needs the ablest business man obtainable to head its commercial activities. Among the men now holding these posts are many who with encouragement and practical co-operation can measure up to the full opportunity. Many others have been ill chosen. But it is a policy that is at fault primarily. These men need broader knowledge, yes, but first of all the business management must be made a bigger job.

More Light on the Cost of Distribution

A PAGE of statistics on the electrical supply jobber's cost of doing business appears in this issue. It is a presentation similar to but more complete than that published in the March 25 issue of the ELECTRICAL WORLD as a part of the article entitled "A Study of Jobbers' Sales and Costs." The figures printed this week cover a full year and embrace the operations of five houses; the others were for six months only. The findings as to costs and averages are similar. Throughout the entire year 1921 the jobbers were losing money heavily, and these figures show why.

As one jobber put it, "Why do we do it?" He was discussing the findings of this survey. "I think we jobbers ourselves are largely to blame for our own predicament," he said, "because it is an old saying of the manufacturers that the more profit they give us the more cheaply we sell our goods to our customers. In other words, too many jobbers do not keep the full profit that is allowed them." There is much truth in this. In fact, the thought that bears in heaviest in studying these statistics is amazement that men could be willing to sell so much merchandise at so beggarly a profit and to carry so much slow-moving stock that the average turnover is reduced to 2.49.

Happily times are now better. Most of the jobbers are at last back across the profit line or at least pulling surely out of the red. But the experience of these lean years just gone and the evidence of this study of costs should not be laid aside and forgotten. The distributor must prosper or the distribution cannot maintain good health and therefore good service. Yet full, freely functioning distribution is absolutely vital to all—to the men who sell to and buy from the jobber as much as to the jobber himself. And the work must be put upon a basis that pays adequate returns.

Over-regulation of Radio Installations Undesirable

AN ORDINANCE has recently been passed in Chicago for the control of radio installations which is so drawn that it can give rise to gross abuse. Not only are inspections charged for at prices that local authorities estimate will bring in $100,000 yearly, but reinspections are provided for on a basis subject to the whims of city officials. The way is also left open to impose in the future a requirement that none but licensed electricians shall make installations. In Chicago this means union labor and possible, if not probable, graft.

It is undoubtedly necessary that some sort of control over the installation of radio sets be maintained. Central-station companies are interested in this because of conflicts with distribution lines that create hazards for which they may be held liable in some measure. Some fatal injuries have occurred already, and many conditions can develop which will be undesirable for every one concerned. Ample clearances from the lines of power companies, a few simple wiring requirements and the provision of a simple form of protector to care for possible lightning discharges are all that are necessary for receiving sets. Transmitting sets require more elaborate precautions, since they can produce serious service disturbances to nearby lines or the circuits from which they draw their power supply. However, these precautions are not complicated, and to enforce them it is not necessary to over-regulate the entire industry.

Before any other cities pass ordinances regulating radio installations it would be advisable for them to study the proposed specifications for such work recently prepared by a committee of the Radio Institute.

System Analysis and Adequate Maintenance Essential to Proper Protection

THE value of various schemes and apparatus for protecting equipment and increasing service reliability is just now the subject of considerable controversy. In large measure the failure or success of a protective system or apparatus depends on two things—first, an analysis of the particular system, and, second, operating methods to maintain the protective equipment at its maximum efficiency.

The analysis of the system should be detailed and should be based on operating and service requirements both for the present and for the future. This analysis involves the mechanical strength and insulation of all elements in the system from generator to substation, because questions of factor of safety and permissible time duration of overloads are fundamental. Moreover, the time required for successive operations of protective equipment must be accurately determined. Having the system analysis, an intelligent study of the protective devices and systems now available will indicate the types of installations to be made. In general, the addition of protective equipment is cheaper than adding to the insulation or mechanical strength of major apparatus, so that reliability is the chief consideration.

The second and a badly neglected element in the situation is found in the fact that delicate apparatus is often installed and maintained by incompetent or inadequately instructed men. The relay is as fragile as a switchboard meter, yet often has an accuracy requirement comparable to that of a precision wattmeter. Hence its proper adjustment and maintenance should be placed in the hands of skilled relay men who not only know relays but also know their functions at each location. Hit-or-miss relay test and maintenance methods are worse crimes than poor wattmeter tests because more responsibility rests on the relay. It must maintain service and protect a large capital investment.

If a broader view of the protective situation is taken, there is no doubt that any existing light and power system can increase its service reliability by the intelligent use of existing protective schemes and equipment, provided that it maintains them at maximum service efficiency.

Service-Cost Analysis Must Precede Solution of Power-Factor Metering

THE building of rate schedules and the devising of metering schemes to arrive at a fair charge against a customer for operating his load at less than unity power factor can be done only with due regard to the real economics of the problem. Theoretically, and to some extent actually, there is a loss due to the existence on any circuit of a power factor less than unity; but the determination as to the final form of the rate schedule and metering scheme necessary to permit charging the customer for this loss will be based entirely on the practical balance between the loss stated on a money value basis and the cost of determining and charging for the loss. Unfortunately too much of the discussion that has been indulged in during the past few years has been concentrated on the purely theoretical side of the subject. This has been due somewhat to the fact that metering equipment which will permit of ready determination of the losses has not been available. Although some equipment could be purchased, it has been of a character and price that prohibited its widespread use.

This situation is gradually changing, and while it has been impossible for manufacturers completely to solve the metering equipment problem so that all classes of service can be readily investigated, equipment that can be used for the more important classes of service is becoming available and better means of determining conditions are therefore at the command of the investigator.

In the May 6 issue of the ELECTRICAL WORLD, on page 877, Messrs. Doran, Hodtum and Fryer discussed some of the economic phases of the problem. In this issue they discuss metering schemes and the type of equipment available for the determination of some of the factors on which the economic phases are based. At the present time there seems to be a strong drift in the direction of utilizing the kilovolt-ampere-demand basis as the best method of reaching the desired results. Some authorities, however, are inclined to believe that this tendency is merely a step in the development of a better and more comprehensive basis.

In the heat of discussion and when there is radical disagreement it must be remembered that the type of study at Cincinnati on which the articles mentioned are based is the shortest and best road to the final answer. For that reason the two articles deserve thorough study, and real efforts should be made to extend the field of investigation they open.

Centralized Control Advocated for System Operation and Emergency Maintenance

SHARPLY focused views of staff responsibility for system operation and emergency maintenance are put before the reader in this issue by William H. Atkins. Year by year the conception of what constitutes good and efficient service rises in the minds of progressive central-station men above former levels of reasonable content with operating performance. The amount of hard work constantly being done behind the scenes to supply the great public with electricity at all hours and regardless of weather and other physical conditions is beyond the popular imagination. Lower unit costs may often be the reward of such efforts, but the greatest gain is to the people served by the utilities.

System operation at Boston is undergoing a sort of grooming at present in order that still heavier load responsibilities may be carried with greater co-ordination of responsibility and more effective organization for emergency maintenance and for contacts with the public resulting from changes in operating conditions. It is purposed to centralize both operating and emergency maintenance functions, and how this will be done and how the company's contact with the public should be improved thereby form the burden of Mr. Atkins' story. The problem is not peculiar to Boston, and so its discussion signifies much to other companies of both large and medium size. Very small companies are obliged to place widely diversified responsibilities upon individual executives, but larger organizations will find food for thought in the co-ordination which the author outlines and which has been developed only after earnest study and committee work by experts in the generating, transmitting and distributing forces of the company, including also authorities on engineering, maintenance and public relations.

By putting load-dispatching and system-operation responsibilities upon a single executive of high caliber, with subdivisions of staff to meet the requirements of distribution, service operation and emergency main-

tenance and inspection, it is believed that much lost motion will be eliminated, that repairs will be more accurately and quickly determined upon, and that the public will be brought much more nearly into phase with the company's efforts to render the best possible service than is feasible under the present organization. The greater use of indicating apparatus in system operation is forecast, with the establishment of an improved operating center, freed as far as may be from local hazards.

No reflection upon present staffs should be read into a "betterment" story of this kind, but we believe the reader will lay down the article with the conviction that preparedness and foresight spell opportunities for utilities run with open minds and with a personnel loyally trying to raise their daily work to higher planes of achievement. Of such are the real joys of service, whatever the size of the company concerned.

Construction Accounting Coming to the Front

CONSTRUCTION accounting as a factor in the support of property accounts is growing in the favor of utility men. For a good many years there has been an undercurrent of feeling that too many detailed property records, such as real construction accounting would provide, might be used as a club by regulatory bodies to keep down the value of investments for rate-making purposes. There has also been the fear that perhaps by setting one job against another without consideration of the circumstances under which each was done, the detailed figures might be used to prove charges of inefficiency in construction methods.

Facts never do so much damage to a fairly and honestly conducted concern as does a lack of them. Public utilities have been involved in rate cases where the actual amount of money invested in the physical property could not be ascertained to a certainty from any available records. Opinions have been taken, and the final decisions of the regulatory bodies in all too many cases have been compromises between opposing opinions that have left every one connected with the cases dissatisfied and have engendered a public suspicion that some one has not played an honest game.

It requires money to build utility properties. The cost of the physical property used in the service of a utility will always be a vital factor in any rate case before a commission. Such bodies have the authority to ascertain all the facts in connection with investments. There is enough legitimate difference of opinion as to the other factors involved in rate making to employ all the energy available without fighting battles over things that ought to be susceptible of proof so definite that it cannot be gainsaid. Construction cost records are needed of such a nature that they tell a convincing story and will stand against the mere expression of opinion.

In this issue W. Paxton Little describes the elements of a system that has been in successful use for accomplishing this result. Though Mr. Little's construction accounting program is of recent date, it is not in an entirely untried field, for the general plan which underlies his method has been in use in a number of forms and on a number of systems for a period of years. Criticism of his system there may be, proceeding largely from a difference of opinion on details, and this is perfectly logical, because no one plan can be devised to fit every utility system. But the vital point is that the fundamental facts be correct and expressed by methods that will fit specific problems. It costs something to carry out such a program, but it also costs money to prove property values when no real original evidence is available.

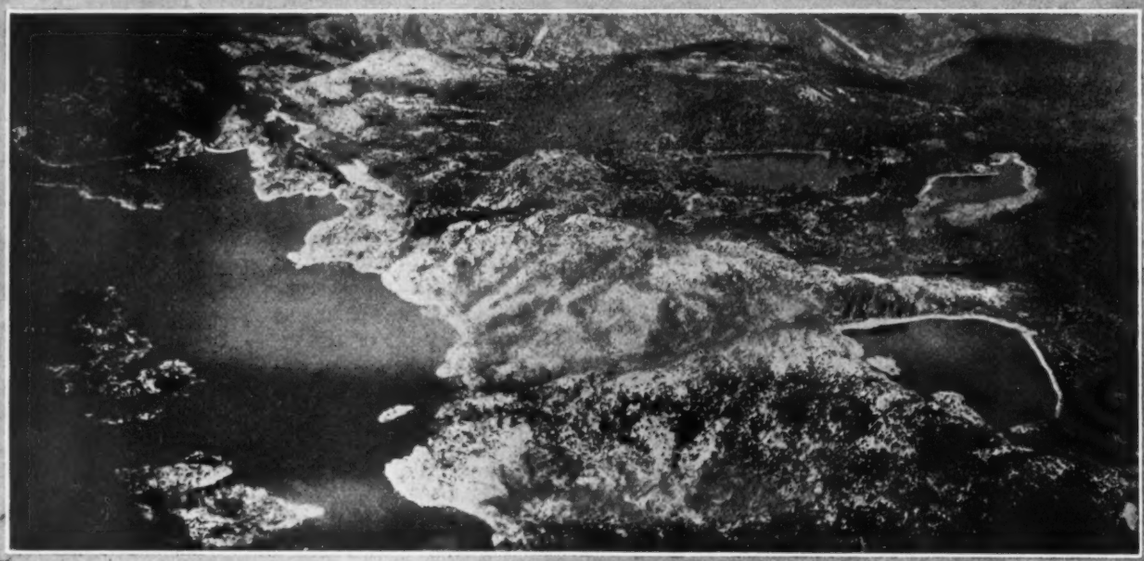
Another Notable Development in Radio

READERS of electrical literature should now be fairly well accustomed to the term "negative resistance." While there can be no such thing as a conductor having negative resistance, certain types of circuits show decreasing resistance with increasing current and may therefore be regarded as having negative resistance added to the initial higher positive value corresponding to a lower current. A most interesting example is the regenerative oscillating circuit of the three-electrode vacuum tube used in radio transmission. In this case the feed-back electromotive force introduced in the oscillating circuit increases the amplitude of oscillation; that is, the result is the same as would be caused by a decrease of resistance or the adding of negative resistance. The system is self-starting owing to filament irregularities or extraneous disturbances, and the amplitude of oscillation increases to a point where the current-carrying capacity of the tube prevents the further insertion of negative resistance. In this condition the regenerative circuit may be said to have zero resistance, the plate circuit of the tube furnishing the increased resistance loss in the oscillating circuit. This has usually been assumed to be the limit of the possibilities of the negative resistance feature of the regenerative circuit.

However, just ten days ago Edwin H. Armstrong demonstrated before a New York meeting of the Institute of Radio Engineers that the resistance of the regenerative circuit may be made to pass through zero value and become negative as a whole by varying the voltage of the plate of the tube by connection to the plate of a second tube whose grid is excited by suitable means. Now, a circuit of resultant negative resistance has the property that when an oscillation is started in it the amplitude tends to build up to infinity. Mr. Armstrong has conceived the idea of using this property as a means of amplifying incoming signals. He has succeeded in doing this by an ingenious method of eliminating the tendency of such a circuit to build itself up to the limit of the tubes, under extraneous disturbance, and in so doing lose its amplifying power. The method is to introduce a relatively low-frequency alternating electromotive force from the grid of the second tube. During one-half cycle the resistance of the amplifying regenerative circuit is negative and during the other positive; the average value is positive and the circuit does not run away with itself. However, during the negative-resistance periods the impressed electromotive forces from the incoming signals set up very large free oscillations, causing amplification in the usual detecting circuits. The auxiliary electromotive force serves as a sort of "tikker" for interrupting the tendency of the regenerative circuit to load itself.

Since amplification up to 300,000 times the impressed emf. is claimed for this super-regenerative circuit, and since it is particularly immune to spark interference, according to Mr. Armstrong, it appears to have great possibilities of extending the range of reception of radio communication. Besides, it is remarkable as embodying a newly discovered property of vacuum tubes which is an example of the surprises in store for the patient researcher in the radio field.

Airplane Has Attractive Advantages in Hydro-Electric Surveys, Construction and Transmission Maintenance



RECONNAISSANCE work for hydro-electric development and transportation of construction personnel and equipment have been successfully undertaken by means of the airplane on at least two occasions by R. C. Starr, chief engineer of the San Joaquin Light & Power Company. The airplane has also been tried for inspecting and repairing long stretches of transmission line. With a certain amount of experimentation and development it appears that the airplane might be used more extensively for like purposes. By means of aerial photography an entire watershed can be explored and mapped in a few days. Besides showing the general lay of the land an immense amount of valuable detail can be obtained as well. Used for transportation of construction personnel and equipment the airplane would make accessible many sites that would otherwise require many miles of expensive, circuitous roadbuilding that would be very time-consuming. For patrolling long lines and enabling prompt repairs the airplane also offers a method of effecting the work in short order. For the foregoing services the chief requirements are that the plane shall be capable of carrying moderate weights and especially of landing easily at moderate speeds.

Accounting for Construction Projects

Commission Regulation Requirements Give Importance to Proper Accounting—Actual Unit-Cost Information Needed as Guide to Engineers and Executives—Outline of Specific Methods that Have Been Found Successful

By W. PAXTON LITTLE
Treasurer The Niagara Falls Power Company

ACCOUNTING for the cost of construction or investment in property of public utilities, regulated as they are by federal or state commissions and in many cases by both, and required to conform to a uniform classification of accounts, necessarily must be done with great accuracy for the protection of both the investors in the property and the public to whom it renders service. The fixed-capital accounts representing costs of investment are the basis on which are determined fair rate of return to the investor and cost of service to the public.

In the early days of electric public utilities such accounts had not the importance which they have now and usually were so condensed in the corporation's books of account as to furnish little information other than the amount of the investment. The engineering or construction departments kept for their own purposes such record of detailed costs as they deemed requisite and were able to obtain in an unsystematic manner. Today, however, the accounting for fixed capital is of such importance that the methods and systems used must furnish, in addition to the information required for the owners of the property and the regulatory governmental bodies, such data in such detail as will permit the preparation at regular periods of reports showing comparison of actual unit costs with estimated costs.

These reports to be of value to the executives and engineers in charge of construction must be "up to the minute" so that the expenditures may be compared with the estimates and the reason for any discrepancy immediately determined. Such reports will also show the rate at which expenditures are progressing and will thus act as a guide to the financial executive. It is obvious that a system of accounts for fixed-capital costs kept to furnish the information referred to will constitute a permanent record of the utmost value. The system and methods described below provide satisfactorily for the fixed-capital accounting of a large hydro-electric utility. It is the system now in active use by The Niagara Falls Power Company in accounting for construction projects.

A SUGGESTED SYSTEM

When a new development or extension to an existing plant is contemplated, the engineering department prepares plans and studies thereof and submits them with detailed estimates to the board of directors for its consideration, accompanied by a request for a project order or authorization (Fig. 1). If the board decides that the work is to be undertaken, a project order or authorization (Fig. 2) is issued by the executive.

Each major division of the construction has assigned to it a project order or authorization bearing a number. Subdivisions thereof also have their project orders or authorizations bearing sequential numbers. For example, the project order covering power-house buildings may be designated as Project 4400. This project would be further subdivided in accordance with a standard classification: "Project 4401—Clearing site for power house;" "Project 4402—Excavation for power house;" "Project 4403—Foundation for power house," etc.

A brief title of the specific work appears on the project order, followed by more detailed description and a classified estimate of costs, and the various departments of the company interested are furnished with copies. When the accounting department receives its copy of the project order, a project ledger sheet (Fig. 3) is prepared. Upon this sheet are entered the project number and description, and in addition to the columns provided for charges for materials, miscellaneous items and labor, five blank columns are provided to facilitate accounting for costs peculiar to that particular project. For example, on a project covering the construction of foundations of power house the blank columns may be used for costs of cement, reinforcing steel, etc.

METHOD OF ACCOUNTING

To illustrate the method used in accounting for the cost of construction, the elements have been classified:

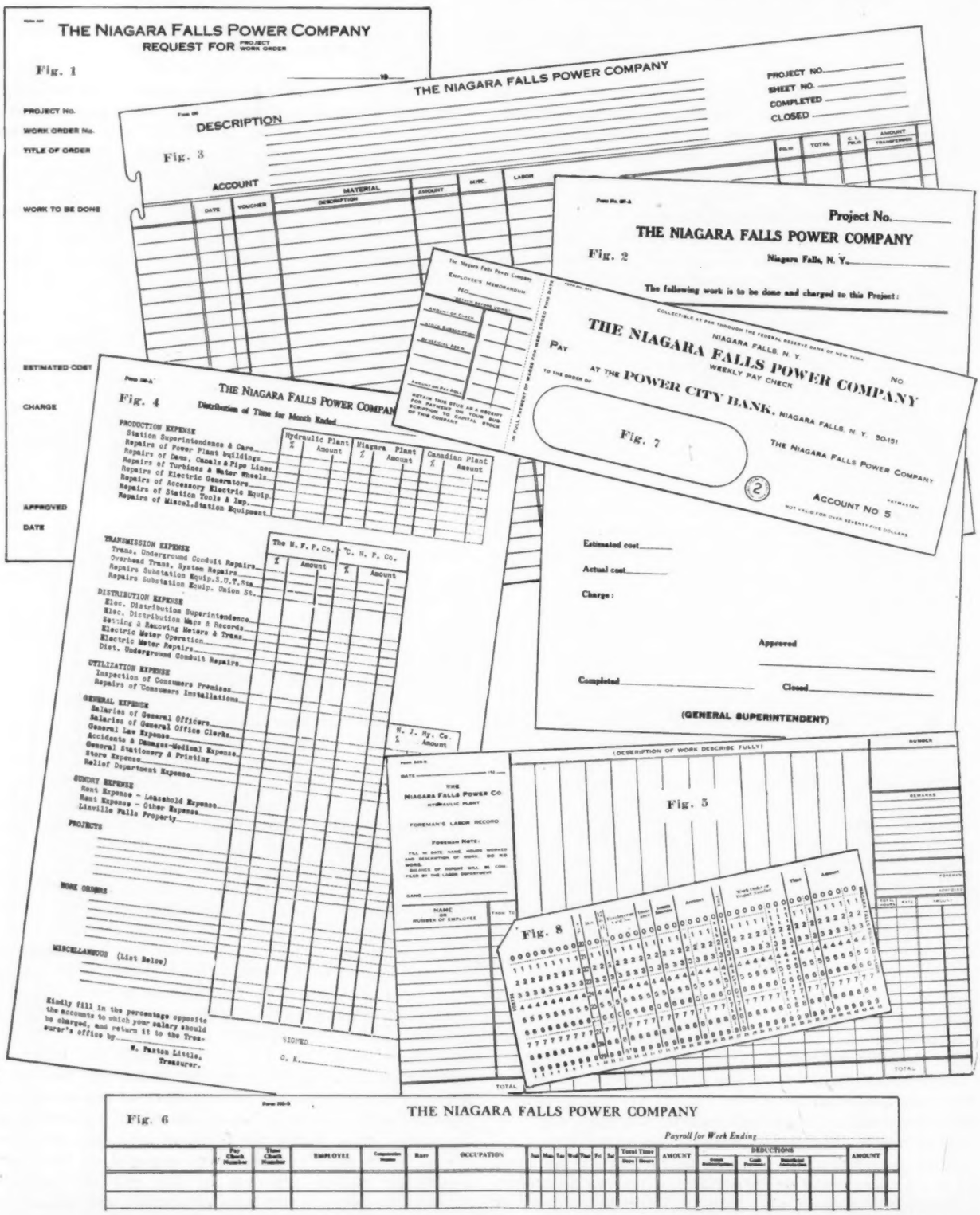
1. Labor: (a) Salaries; (b) wages.
2. Materials and supplies: (a) Materials charged from stores on requisitions; (b) materials charged direct from invoices.
3. Materials transferred or retired.
4. Trucking.
5. Construction equipment.
6. Interest, taxes, etc., during construction.

Each salaried employee is required to file monthly with the accounting department on a form (Fig. 4) the distribution of his salary according to the accounts indicated. These reports are summarized on the monthly pay rolls, and the items chargeable to construction or projects are posted in total direct to the project ledger. The aggregate of the charges so posted is posted to the control account "fixed capital" in the general ledger.

Employees appearing on the weekly pay roll are under the supervision of foremen. Each foreman in charge of a gang is required to furnish the general superintendent each morning with a time or gang card, signed by him, entitled "Foreman's Labor Record" (Fig. 5). This card shows for the previous day the name or number of each employee coming under the foreman's personal supervision, the total number of hours worked, together with a description of the work performed by the gang, under which the foreman indicates the number of hours each employee was engaged on the work described. After approval by the general superintendent the project numbers assignable are affixed by the proper department in accordance with the classified

description appearing on the upper part of the card. After verification of the distribution by project numbers is made by the accounting department the cards are forwarded to the pay-roll department, where the total hours appearing opposite the name of the employees are entered on the weekly pay roll (Fig. 6) and at the same time the rate per hour of each employee is entered on the card (Fig. 5).

When all the time cards (Fig. 5) of the previous day have been received by the pay-roll department, a consecutive number is given to each card. This numbering begins with the numeral 1 applied to the first card received the first day of the month. The pay-roll department computes on each card the amount payable to each employee, and at the same time the total amount of pay earned for the day is computed from


THE NIAGARA FALLS POWER COMPANY
REQUEST FOR PROJECT WORK ORDER
Fig. 1
THE NIAGARA FALLS POWER COMPANY
Fig. 3
Project No.
THE NIAGARA FALLS POWER COMPANY
Fig. 2
Niagara Falls, N. Y.
The following work is to be done and charged to this Project:
THE NIAGARA FALLS POWER COMPANY
WEEKLY PAY CHECK
AT THE POWER CITY BANK, NIAGARA FALLS, N. Y.
Fig. 7
ACCOUNT NO 5
Fig. 4
Distribution of Time for Month Ended
Fig. 5
Fig. 8
THE NIAGARA FALLS POWER COMPANY
Payroll for Week Ending
Fig. 6

FIGS. 1 TO 8—LEDGER SHEETS AND FORMS USED IN CONSTRUCTION ACCOUNTING. DETAILED DESCRIPTION ON PAGE 1214

the weekly pay roll and must balance with the total of a similar computation from the daily time cards. At the end of the week each employee's earned wages are computed and the pay roll is balanced with the aggregate of the daily totals referred to above. Pay checks (Fig. 7) are then prepared by the paymaster.

In the preparation of the pay rolls and pay checks an addressograph and an "F. & E." motor-driven check writer and protector are used to the fullest extent. The pay-roll department forwards the day's time or gang cards (Fig. 5) to the tabulating department, where the data on them are transferred to Hollerith cards (Fig. 8). The Hollerith cards are automatically totaled, and this total must agree with the total of the weekly pay roll as well as with the total of the gang cards. After this verification the gang cards are placed in chronological order and filed. By the use of the Hollerith cards and tabulating and sorting machines, daily reports (Fig. 9) are then prepared showing a classified distribution of the wages of the previous day for both day and night shifts and total to date, as well as the number of men engaged on each class of the work. Unit costs are computed and stated where applicable, and for comparative purposes standard unit costs are also stated.

At the end of each week there is prepared a cost report for that week (Fig. 10). Labor and material are summarized and the costs shown separately against the several projects with the total for the week and the total to date. In the next columns appear respectively the amounts of the original estimate and the amounts of increases or decreases in the original estimate due to alterations of plans, etc. The percentage of construction completed is calculated and an amount equal to that percentage of the revised estimate is compared with actual cost to date. The amount of percentages by which the actual costs to date differ from the estimated costs to date are then determined and shown on the report. The form may be further elaborated to show credits to any of the several projects during a given period and the estimated distribution of balances to be expended weekly, monthly or annually as the case may be. The value of this report is obvious.

At the close of the month the Hollerith cards above referred to are automatically summarized and the results obtained are entered on a summary sheet (Fig. 11) showing project numbers and the amounts chargeable to each. The items appearing on this summary are then posted to the project ledger (Fig. 3), and corresponding entry of the total is made in the general-ledger controlling account, after which the sheets are filed chronologically in a binder.

Materials passed through stores are issued on requisitions, Hollerith cards (Fig. 12). On the requisition are stated the quantity ordered and quantity and description of material issued, unit price, place delivered, construction on which used, and account or accounts to be charged. It is forwarded by the stores department to the accounting department, where the distribution of account is verified. From that point the requisition (Fig. 12) is handled in the same manner as the Hollerith labor card (Fig. 8).

Invoices bearing items chargeable to construction which are not passed through stores account, after passing through the usual routine of the accounting department, are sorted by projects, and by the use of an Elliott-Fisher bookkeeping machine are recorded on an individual project sheet (Fig. 14) simultaneously with their entry on the invoice register (Fig. 13).

At the close of the month the total on an individual project sheet (Fig. 14) is posted to the corresponding account in the project ledger (Fig. 3), and the total of invoices charged to projects in the invoice register (Fig. 13) is posted to the control account in the general-ledger fixed-capital accounts.

Materials transferred from one project to another, or an account other than construction or retired from service, are recorded on a material transfer and retirement report (Fig. 15). These reports contain a full description of the material, the original cost, estimated if not known, account to which originally charged, and amount of depreciation, if any, and are approved by the officer of the department under whose supervision the material is transferred or retired from service. After verification of the distribution by the accounting department, these reports are summarized in a material transfer and retirement report register (Fig. 16). Debits or credits to the individual projects are posted from the material and retirement reports (Fig. 15), and aggregate totals appearing on the material-transfer and retirement report register (Fig. 16) are posted to the control account in the general ledger.

TRUCKING

Where a company carrying on its own construction employs a large number of trucks for disposing of excavated material, etc., an individual work order is issued to cover furnishing of supplies to and maintenance of each truck. These work orders are closed monthly into a clearing account entitled "Trucking." A daily record of the use of the trucks is kept and used at the close of the month as a basis for distributing the aggregate of the total charged to trucking among the proper project accounts.

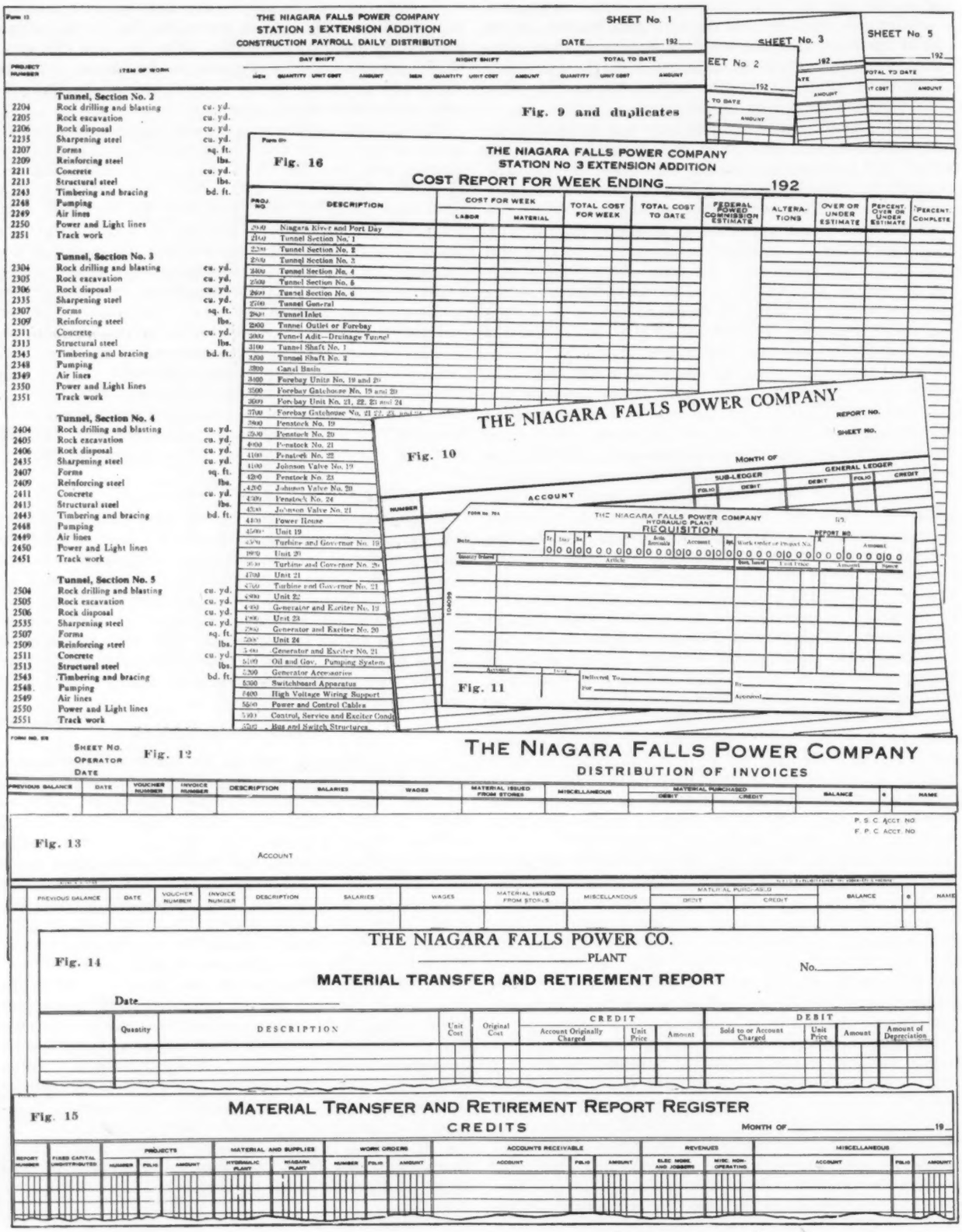
CONSTRUCTION EQUIPMENT

Where a company carries on its own construction work, if the work is of any magnitude, a large investment will be made in construction equipment, such as steam shovels, locomotive cranes, steam locomotives, drilling tools, dump cars, etc. The use of this equipment is recorded daily, and upon its retirement from service its cost, less salvage, is apportioned among the projects in which it has been used. Small tools for which it would not be practicable to account in this manner and whose cost is negligible are charged directly to the project for which they are requisitioned.

At the close of the month the total net debits to each project for that month are posted from the project ledger (Fig. 3) to their appropriate classified construction accounts in the construction ledger (Fig. 17) such as "power-house buildings," "dams," "canals," "pipe lines," etc. The aggregate of the construction ledger balances is then reconciled with the control fixed-capital account in the general ledger. A schedule (Fig. 18) is then prepared showing in detail additions to and withdrawals from the fixed-capital account for the month and period of the current year.

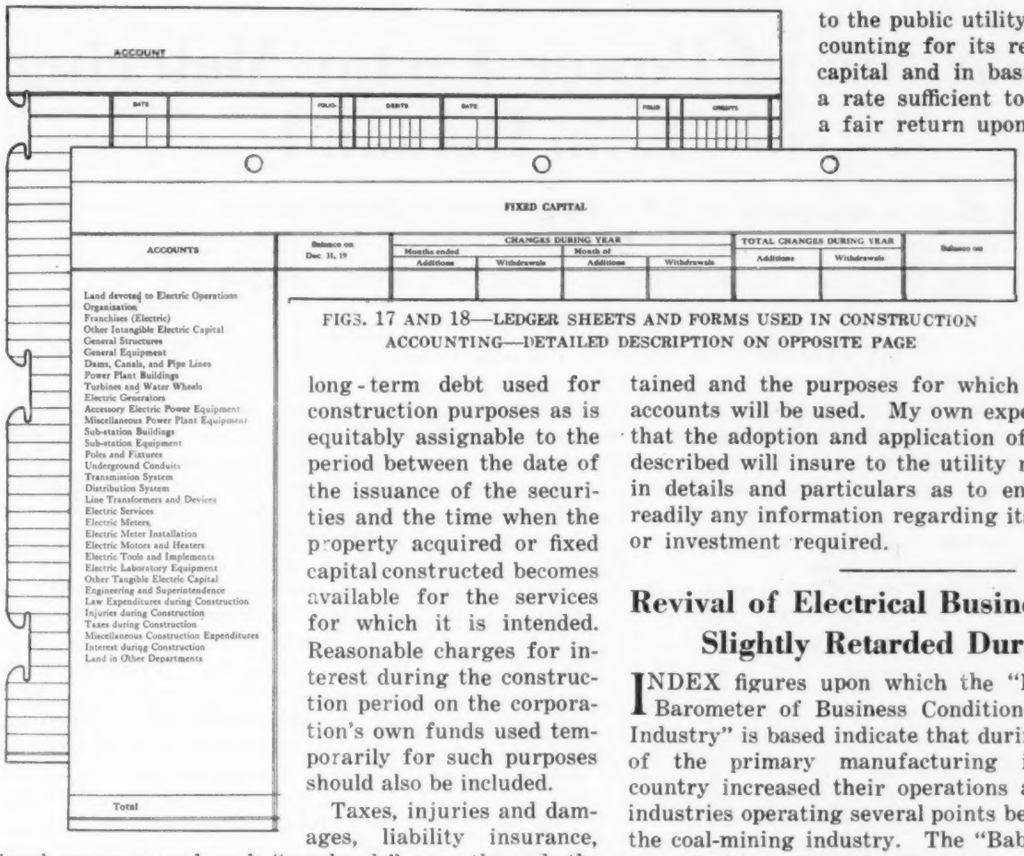
INTEREST AND TAXES DURING CONSTRUCTION

Interest during construction is a well-recognized element of cost and should consist of the interest on funds provided for and used in the acquisition or construction of fixed capital after such funds become available for use and before the receipt or completion or coming into service of the property so acquired. It should also include such proportion of discount and expense on



FIGS. 9 TO 16—LEDGER SHEETS AND FORMS USED IN CONSTRUCTION ACCOUNTING

The complete equipment of ledger sheets and record forms used in The Niagara Falls Power Company's system of accounting for construction projects reproduced in the three group cuts with this article. The use of these forms is as follows: Fig. 1, request for project authorization; Fig. 2, project for authorization; Fig. 3, project record sheet; Fig. 4, salary distribution sheet; Fig. 5, foreman's labor record; Fig. 6, weekly pay sheet; Fig. 7, pay check; Fig. 8, Hollerith cards used by payroll department; Fig. 9, payroll daily distribution sheet; Fig. 10, weekly cost report; Fig. 11, monthly summary of charges to project; Fig. 12, Hollerith cards recording stores issued; Fig. 13, register of invoices charged to project; Fig. 14, classified register of invoices; Fig. 15, material transfer and retirement report; Fig. 16, register summarizing material transfers and retirements; Fig. 17, construction record sheet; Fig. 18, schedule of additions to and withdrawals from fixed capital account.



FIGS. 17 AND 18—LEDGER SHEETS AND FORMS USED IN CONSTRUCTION ACCOUNTING—DETAILED DESCRIPTION ON OPPOSITE PAGE

long-term debt used for construction purposes as is equitably assignable to the period between the date of the issuance of the securities and the time when the property acquired or fixed capital constructed becomes available for the services for which it is intended. Reasonable charges for interest during the construction period on the corporation's own funds used temporarily for such purposes should also be included.

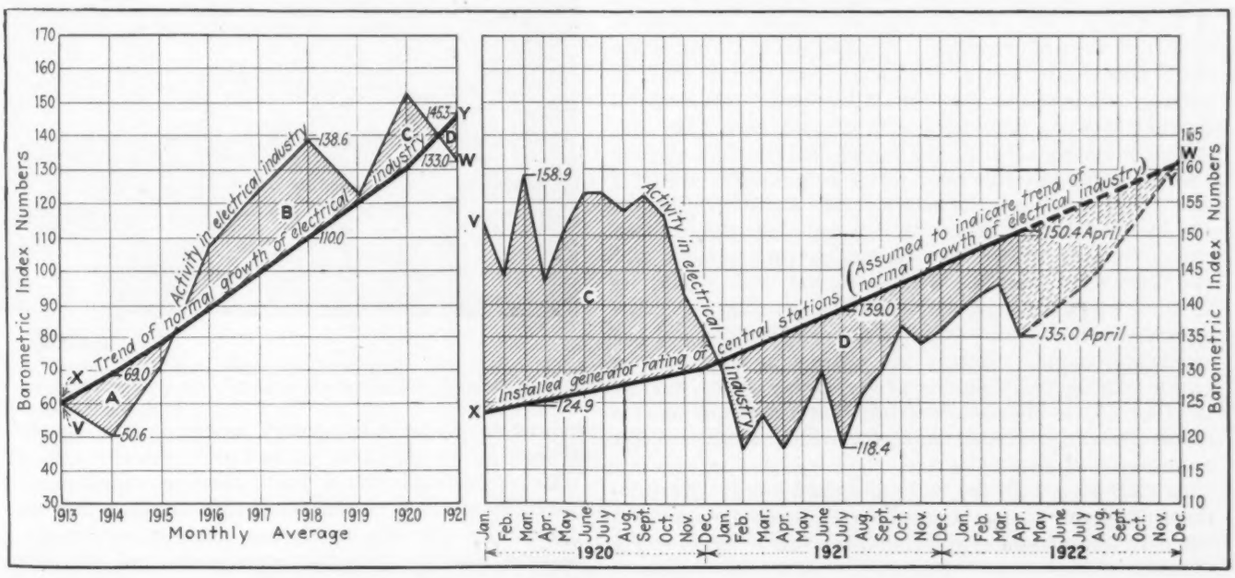
Taxes, injuries and damages, liability insurance, legal expenses and such "overheads" pass through the accounting department practically in the form of invoices and are treated substantially the same as invoices included under item 2 (b) above. The treatment of general office salaries and expenses and engineering and superintendence has been dealt with under item 1 (a).

In pursuing the method of accounting for construction costs as described above the accounts may be kept with such particularity as to details as is required and desired and so that such accounts will constitute a complete up-to-date inventory of the fixed-capital investment at cost. This record, of course, is of great value to the public utility corporation in accounting for its retirements of fixed capital and in basing its claims for a rate sufficient to enable it to earn a fair return upon its investment.

Accounting for the cost of construction or investment in property of public utilities requires an intimate knowledge of the results to be obtained and the purposes for which statements of the accounts will be used. My own experience satisfies me that the adoption and application of the method above described will insure to the utility records so complete in details and particulars as to enable it to furnish readily any information regarding its fixed-capital costs or investment required.

Revival of Electrical Business Conditions Slightly Retarded During April

INDEX figures upon which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" is based indicate that during April only three of the primary manufacturing industries of the country increased their operations above March, some industries operating several points below March, notably the coal-mining industry. The "Babsonchart of American Business Conditions" shows a drop of 17 points from March 21 to April 18 and a slight upward turn during the last part of April. The "ELECTRICAL WORLD Barometer" indicates that during April business conditions in the electrical industry took a drop of 9.3 points on the barometer scale. The electrical industry as a whole during April was operating at 15.4 points below the point of normal demand if growth in the industry had been normal. In March it was operating at 6.1 points below the point of normal demand. Indications are that an increase of several points was made on the barometer scale during May.



"ELECTRICAL WORLD BAROMETER" OF ELECTRICAL BUSINESS CONDITIONS

Comparison of Power Factor Metering Favors Kva. Demand

Cost of Equipment and Results Secured by Five Methods —Comparison on Basis of Steinmetz Method—Tests Showing the Effect of Magnetizing Current on Power Factor

By J. E. DORAN, J. B. HODTUM and R. C. FRYER
Engineers Union Gas & Electric Company, Cincinnati, Ohio

AS WAS pointed out in a previous article,* a power-factor clause fails to define correctly the demand, and the method of obtaining the correction factors is more complicated than if the contract had been based upon the kilovolt-ampere demand. In this connection it may be interesting to compare the accuracy, the instruments, the cost of instruments and the handling of billing in several methods of metering power factor. Five methods are considered, involving the measurement of (1) kilowatt-hour energy and kilowatt demand; (2) kilowatt-hour energy and determination of average monthly power factor by measurement of total reactive kilovolt-ampere-hours (applied to the kilowatt demand); (3) kilowatt-hour energy charge and power factor of the demand interval by measurement of the reactive kilovolt-ampere demand and the kilowatt-demand simultaneously; (4) the French method, involving energy charge in kilowatt-hours plus reactive kilovolt-ampere-hours multiplied by a certain factor (which is understood to be one-third) and the demand in kilovolt-amperes; (5) kilowatt-hour energy and kilovolt-ampere demand. In making the comparisons it will be assumed that metering is required for a 1,000-kw. load on a 13,000-volt, three-phase, 60-cycle circuit.

Using method No. 1, the following instruments are required: One polyphase watt-hour meter with kilowatt-demand attachment, two current transformers, two potential transformers and one meter test block. The total cost would be $537 list. For one customer no chart is necessary. The demand attachments may be integral with the watt-hour meter. Reading and billing costs upon this basis are a minimum, but the method is entirely inequitable for the distribution of demand charges between customers with varying power factors.

Using method No. 2, the following instruments are needed: One kilowatt-hour meter connected to register reactive kilovolt-ampere-hours, one auto-transformer, one kilowatt-hour meter with demand attachments, two current transformers, two potential transformers and two meter-test blocks. The total list cost would be $580. This equipment will give the so-called "average monthly power factor" as a corrective factor against the kilowatt demand. Usually the average monthly power factor will be less than the power factor of the load at the time of the kilowatt demand; therefore in using it a greater so-called correction factor will be applied to the customer's kilowatt demand than should be applied. This method is believed to be discriminatory. Average monthly power factor applied to kilowatt demand will not give kilovolt-ampere demand, the factor most nearly proportional to demand cost, as shown in Figs. 4, 5, 6 and 7. In addition method No. 2 will complicate billing since the total hours and the total reactive kilovolt-ampere-hours must be read and the average monthly power factor computed, after which the correction must be computed. Nine customers out of ten will not understand the method as two meters are required.

With method No. 3 the following instruments are required: One recording kilowatt-hour-demand meter to read kilowatt-hours and kilowatt demand, one recording kilowatt-hour meter connected to record reactive demand during the same interval that the kilowatt demand is recorded, one auto-transformer, two current transformers, three potential transformers and two test blocks. The total cost of this equipment will be $765 list. This method would more nearly approach an equitable basis if it were possible to obtain an equitable power-factor correction. Its cost, including maintenance of two graphic meters, is high. The two charts used must be kept in synchronism. This means careful inspection, and if clocks are used, synchronous charts are well-nigh impossible. The power factor must be calculated from the reading and the corrective factor applied to the kilowatt demand, which means increased cost and likelihood of mistakes in billing. This method does not give the factor that applies most nearly to the cost of supplying this demand, and even if all metering difficulties are overcome, an economic loss still exists.

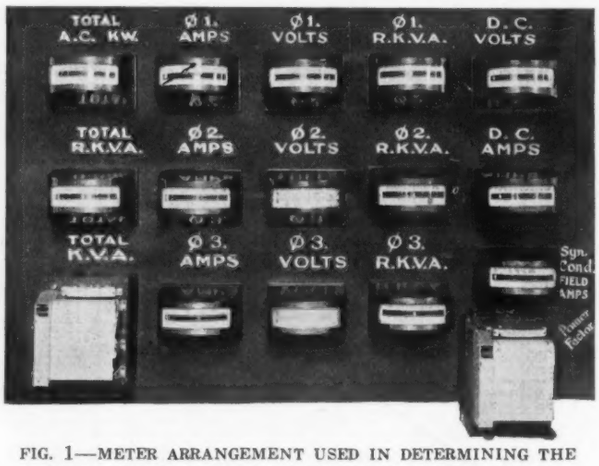


FIG. 1—METER ARRANGEMENT USED IN DETERMINING THE EFFECT OF MAGNETIZING CURRENT ON POWER FACTOR

Using method No. 4, the following complement of instruments is required: One polyphase watt-hour meter registering kilowatt-hours, one kilowatt-hour meter to register reactive kilovolt-ampere-hours, one auto-transformer, one kilovolt-ampere-demand meter, two current

*ELECTRICAL WORLD, May 6, 1922, page 877.

transformers, two potential transformers and two meter-test blocks. This apparatus would cost $824 list. This price may be higher than necessary because it involves a graphic meter. An indicating meter might be used. It is possible to buy combined instruments that might cost less than the instruments listed. It is understood that this method was legalized by the French government

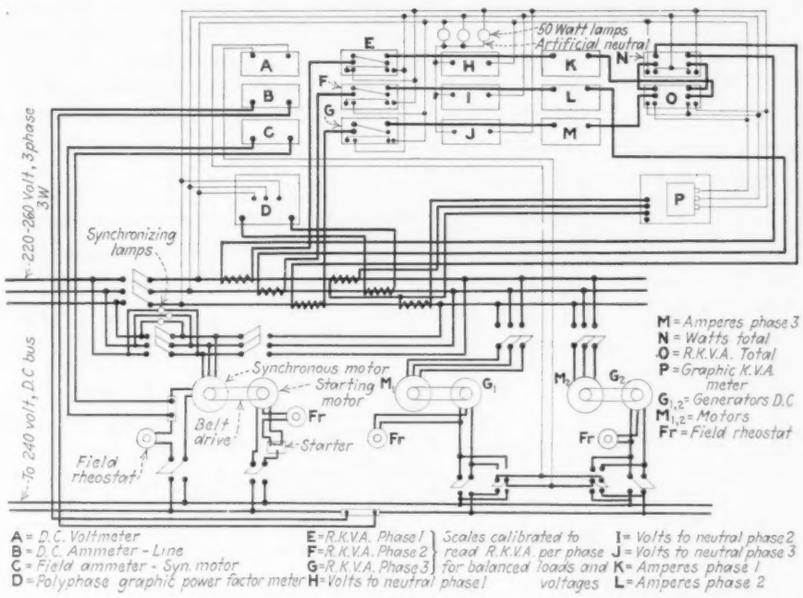

50 Watt lamps
Artificial neutral
220-260 Volt, 3phase 3W
To 240 volt, D.C bus
Synchronizing lamps
Synchronous motor
Starting motor
Belt drive
Starter
Field rheostat
Fr
M = Amperes phase 3
N = Watts total
O = R.K.V.A. Total
P = Graphic K.V.A. meter
G1,2 = Generators D.C
M1,2 = Motors
Fr = Field rheostat
A = D.C. Voltmeter
B = D.C. Ammeter - Line
C = Field ammeter - Syn. motor
D = Polyphase graphic power factor meter
E = R.K.V.A. Phase 1
F = R.K.V.A. Phase 2
G = R.K.V.A. Phase 3
Scales calibrated to read R.K.V.A. per phase for balanced loads and voltages
H = Volts to neutral phase 1
I = Volts to neutral phase 2
J = Volts to neutral phase 3
K = Amperes phase 1
L = Amperes phase 2

FIG. 2—DETAIL WIRING USED WITH METER ARRANGEMENT SHOWN IN FIG. 1

and that the product of the total reactive kilovolt-ampere-hours multiplied by one-third the value of the total kilowatt-hours was added to the energy charge. This method was later declared discriminatory, it is reported, and billing is now on a basis of kilowatt-hours and kilovolt-ampere demand. The original method, at best, would complicate the calculation of bills in a way that would not be thought permissible in this country.

Method No. 5, which most nearly approaches the cost of supplying a demand, involves the following instruments: One polyphase watt-hour meter, one kilovolt-ampere-demand meter, two current transformers, two potential transformers and one test block. This apparatus would cost $779 list. The price given is based on using a graphic kilovolt-ampere meter. For billing a single customer the indicating type might be used. These meters are not yet in regular production and the price is for a die-cast job.

The foregoing method, while attractive in many ways, does not compensate for energy losses at low power factor. However, it makes billing very simple and is equitable in the distribution of demand charges. Demand cost is probably affected by low power factor to a far greater extent than is energy cost. With the actual operating conditions outlined in the previous article, the energy loss due to low power factor is considered less than 5 per cent at 61 per cent power factor during the demand peak. This energy loss should be recovered, but at present no method of accurately metering it is known. The loss is that at the coal pile (in the case of steam plants) and represents the magnetizing-current copper losses applying to lagging or leading magnetizing currents.

Under present conditions the effective idle I^2R losses due to lagging power factor are considered as more important than effective idle I^2R losses due to an equal power factor leading, because of the corrective effect exerted on the system by leading power factor. Consider a possible system operating at unity with two customers going on the line with an equal load and equal power factor, one lagging, the other leading. Under ideal unity power factor conditions, one would be almost as undesirable as the other. The measurement of energy loss due to lagging or leading power factors should be independent of any clause limiting measurement to a point different from unity, be it leading or lagging. This may be more thoroughly understood by considering the equation of the producer's energy loss at leading and lagging power factors, which may be represented as follows: Total current squared minus inphase current squared times effective ohmic resistance of the circuit, including generator and transmission plant plus transformer equipment and auxiliary losses plus additional generator field losses. These quantities are variable in different circuits of the same station. With any factor of resistance determined, the energy loss due to idle current is not due to the idle current squared times the determined resistance factor, but is a value determined by the square of the total current minus the square of the inphase current times the determined resistance, or is proportional to the effective idle current squared times the resistance.

Further comparisons of the suggested methods of measuring energy loss, using Dr. Steinmetz's method as a basis, are shown by the accompanying curves. Dr. Steinmetz's suggestion to correct billing energy for power factor is interpreted by using 16 per cent of the reactive kilovolt-amperes measured as an additive energy correction. All values are computed from an assumed load of 1,000 kw. at 10,000 volts to neutral. As indicated in Fig. 8, Curve A is the billing energy for various power factors using the Steinmetz method; Curve B is the energy which should rightfully be charged if Dr. Steinmetz's method is correct for 90 per cent power factor; Curve C is the energy which should rightfully be charged if Dr. Steinmetz's method is correct for 60 per cent power factor, Curve D that of an overlagged meter and Curve E, an overlagged meter compensated to register correctly at unity power factor.

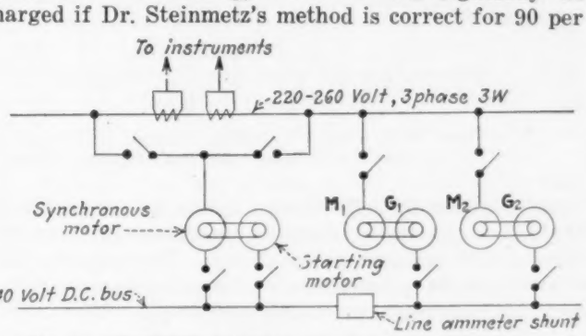
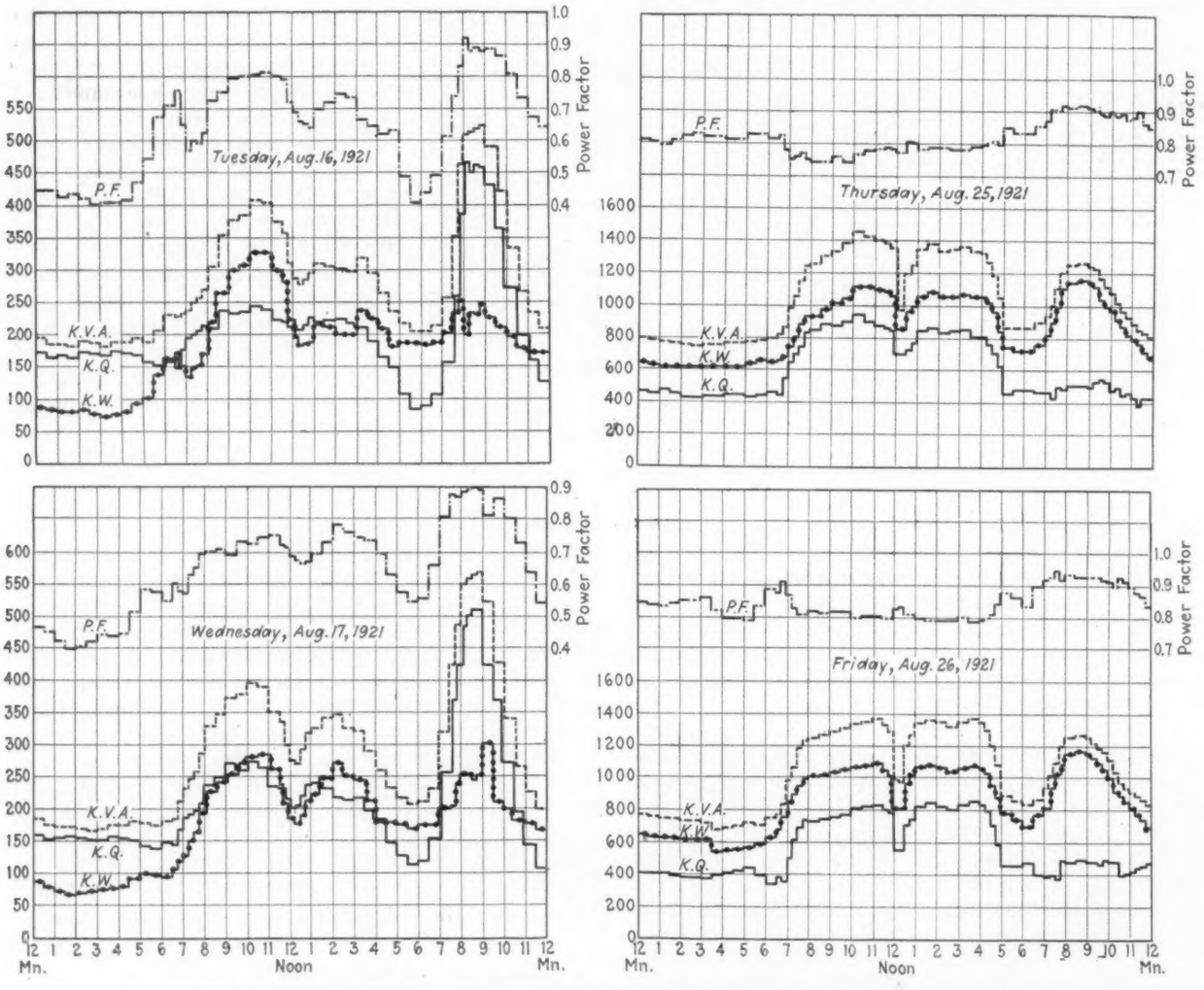


FIG. 3—SIMPLIFIED DIAGRAM OF LOWER PART OF FIG. 2

The calculations for the curves are as follows: Assuming Dr. Steinmetz's method correct at 90 per cent power

factor, and using the assumed load conditions, we get: 16.1 effective idle amperes per phase $3 \times (16.1)^2 = 779$. The reactive kilovolt-amperes at 90 per cent power factor are 483×16 per cent $= 77$, which should be the energy loss due to power factor. The loss equation is, $779R \div 1{,}000 = 77$, where R is the effective resistance of the system per phase for the assumed three-wire, three-phase system. Solving this equation for R we get $R = 99$ ohms. Squaring the current per phase at various power factors and multiplying by three times the resistance factor, the result will give the true energy loss if the method is correct at 90 per cent power factor. These values are plotted in Curve B, Fig. 8. Curve C was obtained in a similar manner, assuming the method correct at 60 per cent power factor. The curves at 60 per cent and 90 per cent are of the same general form but neither corresponds exactly to Curve A. The intersections of the 60 per cent and 90 per cent curves with Curve A show that in the former case the method would charge the customer too much above 60 per cent, while below this value the curve falls below the actual loss. Again assuming the method right at 90 per cent power factor, the customer is charged too much above 90 per cent, while below this value the curves are so far apart that little over one-half the loss value is recovered. The method represented by Curve A more nearly approaches the loss curve in form than any other suggested method. The method seems to be almost the same as that used in France and reported abandoned. Two suggested curves which one manufacturer finds it possible to obtain with the use of only one energy meter and without the use of auxiliary transformers or other auxiliary equipment are plotted as Curves D and E. While these have the same general slope, their general form does not correspond to the general form of these loss curves, and unless they can be made to correspond they should not be used.

At present the conclusion is that no accurate method of measuring energy losses due to low power factor is available, but methods are available for proper measurement of demand charges in units of kilovolt-amperes. The diversity factor should be considered, but this should be done equally in the billing of demand by any other units. The instruments to measure kilovolt-amperes may be constructed to measure in accord with either the first or the second definition under consideration by the standards committee of the American Institute of Electrical Engineers. Definition No. 1 gives power factor in a polyphase circuit as the ratio of the total watts to the arithmetical sum of the volt-amperes in the several phases, each measured to a non-inductive neutral point. Definition No. 2 gives power factor in a polyphase circuit as the ratio of the total watts to the



FIGS. 4, 5, 6 AND 7—POWER FACTOR, KILOVOLT-AMPERES, REACTIVE KILOVOLT-AMPERES AND KILOWATTS MEASURED ON VARIOUS FEEDERS OVER TWENTY-FOUR-HOUR PERIODS

vector sum of the volt-amperes in the several phases. To demonstrate and illustrate the various methods of determining the effect of magnetizing current on the power factor, and to show the variation of magnetizing current in different types of machines under identical conditions, metering equipment was installed as shown in Fig. 1. The indicating meters and the graphic kilovolt-ampere meter were checked against laboratory standards. Two 2-hp., 220-volt, three-phase induction motors were belted to direct-current generators with loading back connections to the direct-current lines. A 5-hp. synchronous motor was connected to float on the line for power-factor correction. Bucking and boosting transformers were connected to give balanced three-phase voltage higher and lower than the voltages stamped on the name plate of the machines. The connections of the apparatus are shown in Fig. 2. Special attention was given to demonstrating the properties of synchronous machinery as used for power-factor correction. With this apparatus the following readings were taken simultaneously: Volts per phase, amperes per phase, reactive kilovolt-amperes per phase, total reactive kilovolt-amperes, total kilowatts, total kilovolt-amperes, power factor, amperes in field of synchronous motors, direct-current volts and direct-current amperes. Each of these readings was shown by an instrument either indicating or graphic. At no time during the entire test, which ranged from 18 per cent lagging power factor to 50 per cent leading power factor, was there a discrepancy of more than 2 per cent in checking the readings of reactive kilovolt-amperes, kilowatts and kilovolt-amperes. The load being balanced, the power-factor meter also checked.

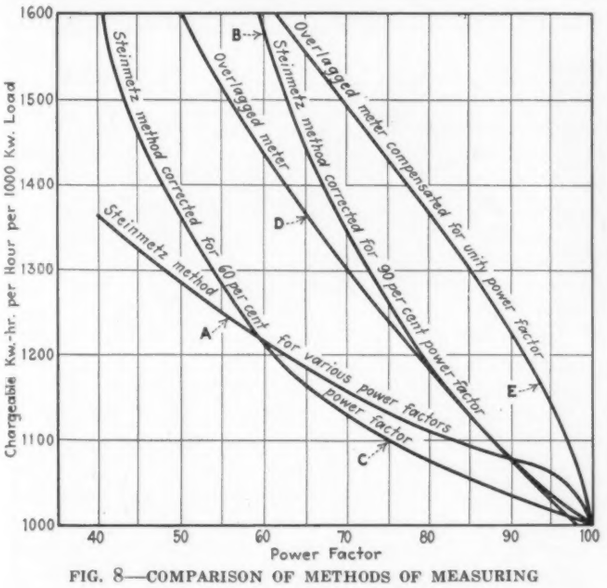


FIG. 8—COMPARISON OF METHODS OF MEASURING ENERGY LOSSES DUE TO POWER FACTOR

Two conclusions are drawn from the test: (1) The kilovolt-ampere meter is the best method of obtaining kilovolt-ampere demand for billing demand purposes. (2) In selecting synchronous motors or converters care must be taken to have the normal voltage of the machines as high as the voltage of the system on which they are to be used. The synchronous motor used in the test was a 220-volt machine. When the machine was operated on a 245-volt line the power factor was lagging for all values of field excitation.

Putting System Operation on a Higher Plane

Advocacy of Placing System Operation, Restoration of Service and Emergency Repair Under Control of a Central Authority

BY WILLIAM H. ATKINS
General Superintendent
Edison Electric Illuminating Company of Boston, Mass.

SUBDIVIDED responsibility for system operation in the modern central station involves losses in time and money which careful study indicates can be cut down considerably by organizing a centralized "load and trouble dispatching division" headed by an operating superintendent who is a high-grade engineer, well balanced, level headed and experienced in the handling of station apparatus, transmission and distribution systems. The Edison Electric Illuminating Company of Boston is keenly interested in this problem, and certain aspects of it may not be without interest to operating organizations of other central-station companies.

The prompt handling of service troubles of whatever nature and wherever occurring is so important today that constant observation and critical analysis of system handling is necessary in progressive companies. I am convinced that a centralization of load-dispatching, distribution and service operation functions may profitably be effected in many cases where the authority of different branches of the central-station organization has either been too limited to span the gap between them or so extensive as to overlap. This overlapping or insularity causes confusion and lost motion in remedying system troubles, whether in plant or on lines or in substations. Time is lost through failure to notify the proper people immediately in case of system trouble and to concentrate upon the job only those most needed to restore normal conditions. The presence of groups of official automobiles where the job is overmanned through uncertainty as to what members of the staff should respond in particular cases also gives undesirable publicity.

BROADENING THE CONTACTS

In the past there has been in not a few companies too little co-ordination between switchboard operators and men working on lines or on customers' premises. The general public has been obliged to call the main office of a company in case of trouble, with resulting delays on large systems in transferring such calls to the proper parties. We are of the opinion in Boston that all the work of system operation and emergency repairs may wisely be placed under a central authority.

It is proposed that the operating superintendent or chief load dispatcher shall head four sections:

1. System operators, directing the operation of the generating stations and substations and transmission.
2. Distribution operators, directing the operation of distributing circuits and feeders, including location of faults and making repairs for restoring service.
3. Service operators, answering customers' complaints and directing the restoration of service when due to minor service failures and interior troubles.
4. Outside forces—call men under direction of distribution operators and call men and inspectors under the service operators.

The chief load dispatcher, according to the foregoing plan, will direct through his subordinates the operation of the generating, transmission and distribution systems

Boston Plans to Centralize System Operation, Restoration of Service and Public Contact

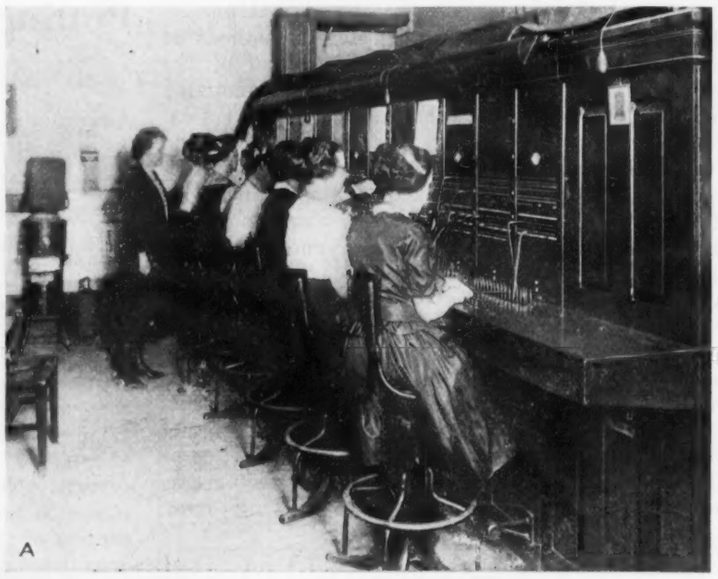
THE functions of the various branches of the Boston Edison organization illustrated in views A to D inclusive are to be centralized in the new operating arrangement outlined by W. H. Atkins. Under a chief load dispatcher or operating superintendent are to be performed the duties of load dispatchers, distribution operators, service operators, and such call men and inspectors as are available for emergency maintenance. The handling of plant, lines, public contact and emergency repairs will thus be more effectively co-ordinated. Among the activities which will be placed under a central authority are the following:

A—Private branch exchange of Boston Edison Company, which handles public inquiries, transferring calls as necessary.

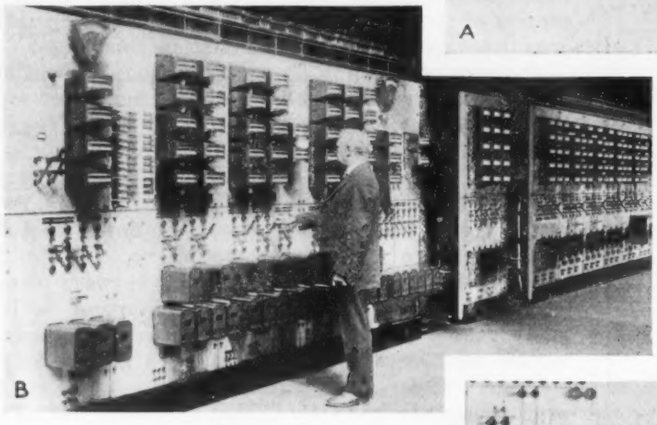
B—Switchboard at L Street station.

C—Call man, maintenance of lines department, equipped with automobile to scene of service trouble.

D—Load dispatchers' headquarters.

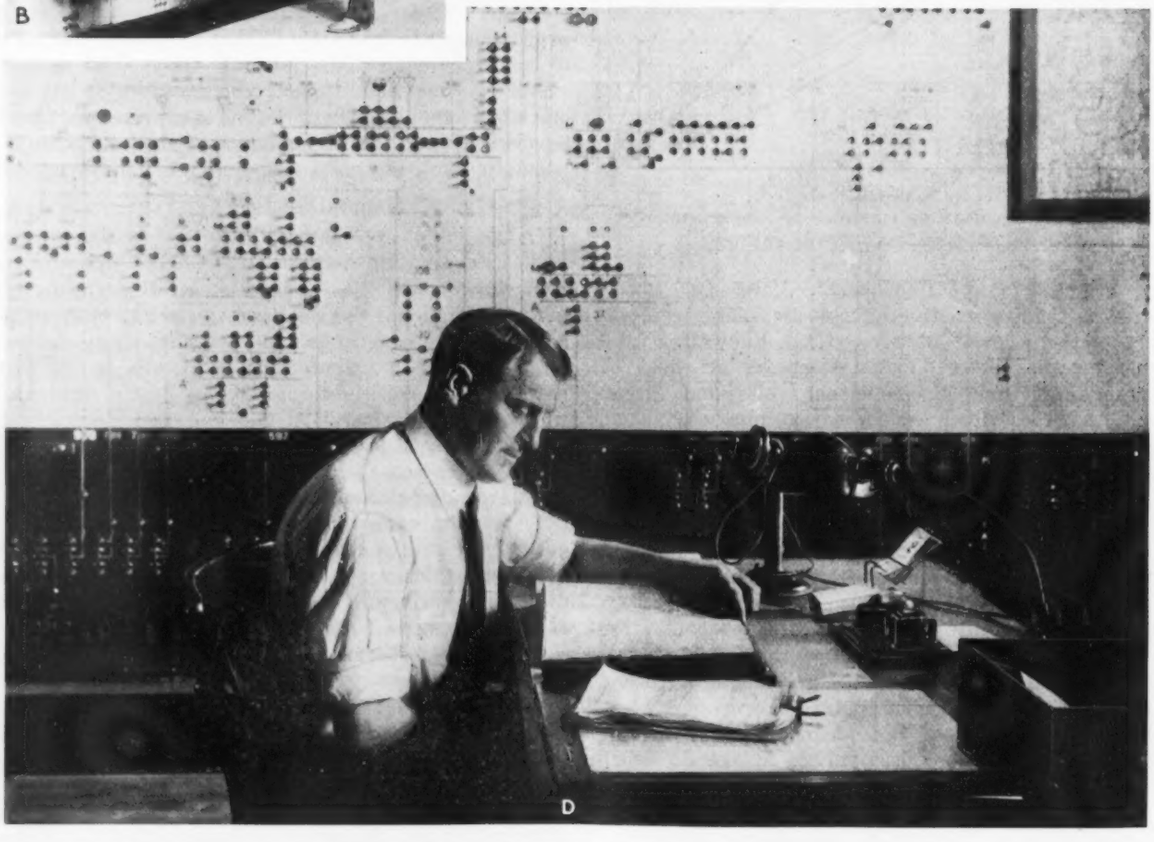


A



B

C



D

and through his subordinates will direct such emergency or temporary repairs on apparatus and lines as may be necessary for the restoration and maintenance of continuous service. At all times he will maintain the fullest possible information for his operators regarding emergency methods of operation for all branches or parts of the system. A part of his work will include the devising and supervision of trials of emergency methods of operation to train operators or others in the duties they may be called upon to perform. The starting of new station equipment may be supervised by him, if necessary or desirable, together with the approval of arrangements for tests on new or existing equipment or lines as made from time to time. Full information, plans, maps, etc., will of course form a part of his equipment, and to him will be assigned the problem of devising methods of transmitting all necessary information to interested departments or individuals regarding system troubles. This official will be authorized to call for assistance from any and all departments, but his work will be so planned as largely to do away with the need of calling upon other officials at all hours of the day or night to keep the system in full operation.

System operators will direct the operating of generating plants and substations, controlling generating station operation and loading, transmission-line operation, substation operation and high-tension switching operations up to high-tension buses at all points including substations. These men will also control switching operations on apparatus in substations, although substation operators will generally perform switching operations on substation equipment as required for loading conditions in accordance with an approved plan of operation for each substation. The restoration of high-tension service to any and all stations, the restoration of service up to substation buses after the failure of substation equipment, and the distribution of load between direct-current substations, will also fall upon the system operators. It may be desirable to arrange that these men shall have no dealings with the outside public.

Distribution operators will direct the operation of distribution circuits and feeders, switching operations on circuits and feeders outside of stations to redistribute load when necessary in emergencies, and the location of faults and repair and restoration to service of all transmission lines, distribution circuits and feeders. Repairs to be made will be only such temporary or emergency repairs as can be made by the "call men" available and as are necessary to restore service. Permanent or extensive repairs will be carried out by the maintenance department as at present. The foregoing work will involve direct control of "call men," the obtaining of progress reports during repair operations, and reports of these to the chief load dispatcher for transmission to interested departments as he may direct or as may be necessary. Distribution operators will co-operate with service operators regarding troubles, so the latter may properly answer inquiries.

Bringing Company and Public Closer

Customers' complaints now handled by inspectors will be turned over to the service operators, who in future, according to the plan above outlined, will direct the movements of inspectors and call men as required to deal with inside troubles and to patrol street-lamp routes where such work is now being done by call men. Customers' complaints of service troubles will be received by the service operators over telephone exchange lines, and it is probable that a special "trouble number" will be established by the telephone company to facilitate the transmission of this information. Service interruptions affecting single consumers will be assigned to inspectors or call men as convenient. If trouble is general, the service operators will be informed as to its nature and extent and thereby be able to handle inquiries efficiently and to avoid the dispatch of inspectors and call men on unnecessary trips, thus reserving their services for important work. Service operations will at all times be in touch with the public by means of the "trouble number."

The location of the headquarters will be governed by many factors, but wherever it is situated full use will be made of the latest developments in signaling systems for indicating the opening and closing of switches of major importance, often remote from the operating center. The problem of telephone facilities will be taken up with the local telephone company and the convenience and economy of various arrangements discussed, with provision for the growth of the system. Desirable features include the provision of separate boards for the three classes of system operators, presumably separated by glass partitions in a single room to insure non-interference and at the same time wired for "listening in" and so arranged as to permit each division to observe the work of the others.

It is hoped that in due course radio-telephone equipment will be available which will greatly facilitate the control by distribution operators of call men on inspection or repair work.

Sources of Personnel Supply

On any system taking up improved load dispatching the existing system operating organization should form the nucleus of the future group responsible for service. An efficient system operating force would logically be transferred to the new co-ordinated staff and be expected to continue along the specialized lines hitherto followed by these men. Distribution and service operators would presumably be selected from a group of men specially trained for these positions, preference being given to young men of good habits, intelligent, alert and well educated, but not necessarily conversant with outside construction. A suggested course of training would acquaint such men with the practical use and operation of all the equipment in service on the system, the arrangement of all equipment in stations, the routing and connections of overhead and underground lines, the methods to be employed in fault location, use of emergency connections, use of record data in formulating operating methods, and finally, the relations which the company desires to maintain with its customers.

Fundamentally an organization such as is here contemplated should be able to do more than merely meet the conditions developed by the failure of individual lines or converting units. In fact, it should be able to meet any contingency, even the destruction of a complete substation. At first glance this may seem a far cry, but with a definite scheme laid out in advance and with the company's facilities and reserves carefully marshaled and arranged in advance, the impossible may be accomplished in a short time.

Acknowledgment is hereby given to L. L. Elden, chairman; R. E. Dillion, J. W. Cowles and J. E. Larrett of the Boston company for their comprehensive study of the load-dispatching and system-operating problem.

Consolidated Summary of Sales, Operating Expenses and Statistical Data by Commodities for Five Houses

TWELVE MONTHS ENDED DEC. 31, 1921

Developed by the Electrical Supply Jobbers' Association

Commodity No.	Commodity Description	Net Sales: Warehouse	Net Sales: Per Cent to Total Sales Ea. Commodity	Net Sales: Direct	Net Sales: Per Cent to Total Sales Ea. Commodity	Net Sales: Total	Net Sales: Per Cent to Total Sales All Commodities	Operating Expenses: Financial and Accounting	Operating Expenses: Selling	Operating Expenses: Warehousing	Operating Expenses: Total	Operating Expense to Sales: Percentage, Direct Sales: Financial and Accounting	Direct Sales: Selling	Direct Sales: Total	Percentage, Warehouse Sales: Warehousing	Warehouse Sales: Total	Bills and Credit Memoranda Issued	Items on Bills and Credit Memoranda Issued	Average Amount of Items on Bills and Cr. Memoranda Issued	Units Received	Units Shipped	Average Selling Price of Units Shipped	Number of Packages Shipped	Times Turnover of Merchandise Owned
1	Wiring devices	$538,517	82.21	$116,553	17.79	$655,070	6.42	$35,096	$57,183	$36,808	$129,087	5.36	8.73	14.09	6.84	20.93	38,537	91,036	$7.20	21,837	361,323	$1.49	64,446	2.34
2	Rubber-covered wire and lamp cord	468,791	60.56	305,269	39.44	774,060	7.59	19,039	41,759	22,297	83,095	2.46	5.39	7.85	4.76	12.61	16,263	31,673	24.44	9,744	64,319	7.29	22,401	2.65
3	Weatherproof wire	162,013	39.41	249,065	60.59	411,078	4.03	6,994	15,383	5,975	28,352	1.70	3.74	5.44	3.69	9.13	3,074	5,173	79.47	4,294	10,062	16.10	5,772	4.93
4	Bare copper wire	20,175	17.50	95,114	82.50	115,289	1.13	1,545	7,443	812	9,800	1.34	6.46	7.80	4.02	11.82	532	660	174.68	62	933	21.62	497	1.21
5	Rigid conduit	238,639	80.89	56,374	19.11	295,013	2.89	6,322	16,157	18,311	40,790	2.14	5.48	7.62	7.67	15.29	4,892	12,524	23.56	24,296	75,115	3.18	36,377	2.80
6	Condulet type fittings	131,250	86.88	19,822	13.12	151,072	1.48	11,415	17,169	13,885	42,469	7.56	11.36	18.92	10.58	29.50	11,631	38,066	3.97	10,325	124,875	1.05	22,506	2.02
7	Outlet boxes and other conduit fittings	84,164	85.78	13,950	14.22	98,114	0.96	8,872	16,081	14,157	39,110	9.04	16.39	25.43	16.82	42.25	9,787	29,306	3.35	8,135	168,712	.50	25,465	1.40
8	Metallic flexible conduit	94,236	86.62	14,558	13.38	108,794	1.07	2,937	6,140	4,566	13,643	2.70	5.64	8.34	4.85	13.19	2,653	5,107	21.30	5,806	16,323	5.77	6,499	3.29
9	Non-metallic flexible conduit	98,395	95.13	5,016	4.87	103,411	1.01	2,597	8,848	5,120	16,565	2.51	8.56	11.07	5.20	16.27	2,406	4,646	22.26	10,000	15,620	6.30	9,643	5.00
10	Metal molding and fittings	16,542	77.70	4,747	22.30	21,289	0.21	1,537	4,615	2,217	8,369	7.22	21.68	28.90	13.40	42.30	1,632	5,384	3.95	2,403	15,939	1.04	2,925	1.83
11	Porcelain knobs, tubes and cleats	80,821	89.60	9,384	10.40	90,205	0.88	3,534	12,643	11,662	27,839	3.92	14.02	17.94	14.43	32.37	3,647	8,751	10.31	2,678	235,008	.34	17,618	1.67
12	House goods	46,924	73.58	16,851	26.42	63,775	0.62	4,473	7,223	3,961	15,657	7.01	11.33	18.34	8.44	26.78	5,772	10,673	5.98	3,026	39,250	1.20	6,466	1.95
13	Tape—rubber and friction	51,653	74.30	17,864	25.70	69,517	0.68	3,565	7,647	4,320	15,532	5.13	11.00	16.13	8.36	24.49	4,355	8,667	8.02	1,590	72,260	.71	8,141	6.48
14	Tools—lineman's and electrician's	21,799	65.33	11,564	34.67	33,363	0.33	2,901	4,844	2,596	10,341	8.70	14.52	23.22	11.91	35.13	2,963	5,423	6.15	1,370	7,990	2.73	2,435	1.30
15	Lamps—large mazda	1,322,174	96.03	55,037	3.97	1,387,211	13.60	31,617	75,717	39,086	146,420 *156,531	2.28	5.46	7.74	2.93	10.67	27,743	57,507	24.12	54,198	147,760	9.02	51,684	†
16	Lamps—miniature	123,360	97.02	3,799	2.98	127,159	1.25	5,477	13,865	4,807	24,149	4.31	10.90	15.21	3.90	19.11	5,947	12,970	9.80	1,528	28,043	4.40	6,296	†
17	Lamps—carbon	13,448	60.90	8,635	39.10	22,083	0.22	1,035	2,238	2,179	5,452	4.69	10.14	14.83	16.20	31.03	1,424	1,860	11.87	375	15,062	.89	2,524	1.85
18	Flashlamps, batteries and cases	60,649	79.72	15,433	20.28	76,082	0.75	6,276	9,247	5,082	20,605	8.25	12.15	20.40	8.38	28.78	8,012	16,511	4.61	2,866	59,042	1.03	8,948	5.85
19	Dry batteries	98,245	82.31	21,116	17.69	119,361	1.17	3,629	8,011	4,190	15,830	3.04	6.71	9.75	4.27	14.02	4,149	5,281	22.60	3,229	32,168	3.05	6,212	8.18
20	Fan motors	175,097	89.71	20,080	10.29	195,177	1.91	4,697	14,699	7,078	26,474	2.41	7.53	9.94	4.04	13.98	4,832	6,170	31.63	5,637	10,547	16.60	6,065	1.93
21	Heating devices	409,291	84.67	74,088	15.33	483,379	4.74	22,149	50,874	22,411	95,434	4.58	10.52	15.10	5.48	20.58	26,558	41,988	11.51	19,534	111,421	3.67	28,007	2.62
22	Washing machines and parts	537,494	95.34	26,251	4.66	563,745	5.52	11,382	70,412	19,099	100,893	2.02	12.49	14.51	3.55	18.06	8,917	13,188	42.75	8,614	18,734	28.69	8,192	6.85
23	Ironing machines and parts	90,683	82.20	19,632	17.80	110,315	1.08	2,205	41,314	7,771	51,290	2.00	37.45	39.45	8.57	48.02	1,400	1,629	67.72	1,058	1,351	67.12	1,029	1.28
24	Vacuum cleaners and parts	201,861	97.05	6,139	2.95	208,000	2.04	3,793	29,167	5,887	38,847	1.82	14.02	15.84	2.92	18.76	3,619	5,063	41.08	5,679	10,641	18.97	4,783	4.20
25	Other socket appliances	49,889	80.41	12,154	19.59	62,043	0.61	2,499	13,325	2,458	18,282	4.03	21.47	25.50	4.93	30.43	2,769	3,740	16.59	1,103	5,778	8.63	2,494	1.53
26	Electric ranges and ovens	111,130	61.43	69,762	38.57	180,892	1.77	4,496	27,974	8,269	40,739	2.49	15.46	17.95	7.44	25.39	3,896	5,538	32.66	2,459	5,611	19.81	2,930	1.29
27	Ornamental street lighting equipment and supplies	16,700	13.82	104,105	86.18	120,805	1.18	2,349	11,561	902	14,812	1.94	9.57	11.51	5.40	16.91	1,452	2,058	58.70	365	6,947	2.40	1,054	2.15
28	Pole-line hardware	87,647	50.41	86,221	49.59	173,868	1.70	6,021	22,281	13,068	41,370	3.46	12.82	16.28	14.91	31.19	5,173	10,541	16.49	9,110	176,765	.50	13,042	2.67
29	Wood cross-arms	58,726	51.69	54,893	48.31	113,619	1.11	2,370	9,575	11,649	23,594	2.09	8.43	10.52	19.84	30.36	1,577	2,751	41.30	39,904	54,102	1.08	32,592	1.91
30	High-tension insulators	42,351	50.35	41,755	49.65	84,106	0.82	2,081	8,138	4,434	14,653	2.47	9.68	12.15	10.47	22.62	1,618	2,529	33.26	2,793	46,040	.92	3,082	3.17
31	Strand, bare iron and steel wire	28,869	72.97	10,694	27.03	39,563	0.39	1,168	5,281	2,785	9,234	2.95	13.35	16.30	9.65	25.95	1,177	1,808	21.88	2,472	4,850	5.95	3,426	2.45
32	Watt-hour meters	18,020	30.13	41,796	69.87	59,816	0.59	1,311	4,882	887	7,080	2.19	8.16	10.35	4.93	15.28	924	1,249	47.89	1,029	1,545	11.66	908	4.28
33	Inclosed fuses	35,949	79.61	9,211	20.39	45,160	0.44	2,920	5,980	2,522	11,422	6.47	13.24	19.71	7.02	26.73	3,473	6,737	6.70	1,327	26,882	1.34	4,798	1.62
34	Renewable inclosed fuses	56,983	93.13	4,206	6.87	61,189	0.59	3,067	6,199	3,741	13,007	5.01	10.13	15.14	6.57	21.71	3,233	7,650	8.00	2,244	32,792	1.74	3,830	1.33
35	Safety switches	53,690	57.61	39,501	42.39	93,191	0.91	3,652	10,699	3,528	17,879	3.92	11.48	15.40	6.57	21.97	3,977	6,817	13.67	2,465	16,030	3.35	4,005	2.25
36	Lighting fixtures	808,570	93.15	59,452	6.85	868,022	8.51	33,120	133,088	73,884	240,092	3.82	15.33	19.15	9.14	28.29	29,675	53,719	16.16	26,765	85,581	9.45	29,876	1.87
37	Automobile accessories	533,990	91.14	51,923	8.86	585,913	5.74	16,363	96,865	29,231	142,459	2.79	16.53	19.32	5.47	24.79	16,795	30,006	19.53	7,362	34,860	15.32	7,233	3.45
38	Apparatus sales	233,322	40.41	344,108	59.59	577,430	5.66	11,461	54,417	19,347	85,225	1.98	9.42	11.40	8.29	19.69	8,212	12,662	45.60	7,654	20,832	11.20	8,019	2.18
39	Sundry commodities	294,199	49.07	305,299	50.93	599,498	5.88	16,233	74,703	30,019	120,955	2.72	12.45	15.17	10.20	25.37	15,516	34,118	17.57	5,603	77,340	3.80	13,838	1.09
40	Miscellaneous	132,401	51.39	125,248	48.61	257,649	2.52	15,330	25,803	15,084	56,217	5.95	10.01	15.96	11.39	27.35	16,145	30,568	8.43	9,250	109,152	1.21	15,439	2.04
	Total	$7,658,657	75.05	$2,546,669	24.95	$10,205,326	100.00	$327,528	$1,049,450	$486,085	$1,863,063	3.21	10.28	13.49	6.35	19.84	316,357	631,747	$16.15	330,189	2,347,605	$3.26	501,497	2.49

* This amount includes $10,111 outgoing transportation, which generally is not considered operating expense, but should be added to these expenses to obtain total cost of handling this commodity

† All merchandise consigned.

The table covers twelve months and embodies the six months study published in ELECTRICAL WORLD March 25, 1922.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Compensated Impulse Gap Subjected to Severe Test

To the Editors of the ELECTRICAL WORLD:

In the editorial in the June 3 issue of the ELECTRICAL WORLD, under the caption of "Compensated Spark Gap an Important Improvement," you inquire what would happen to the gap in the case of a drenching rain. I beg to say that these gaps were given a wet test with five 0.2-in. precipitation nozzles in the laboratory of the Ohio Brass Company. In other words, they were completely flooded by a very finely divided water supply, and this was even more severe than a drenching rain.

Electro Service Company, CHARLES E. BENNETT,
Atlanta, Ga. Chief Engineer.

Electrical Development in Sweden

To the Editors of the ELECTRICAL WORLD:

In a little item which appeared in the ELECTRICAL WORLD on March 18 last what should be prophecy takes the form of fact. Of course there is no such thing in existence as an all-Swedish high-tension line system reaching "from the far north down to Skane in the south." There are indications, however, that such a system will exist some twenty or thirty years hence. It is, indeed, hoped that the future trunk lines will link not only Sweden but all three Scandinavian countries. Unfortunately, however, the recently completed Trollhättan-Västeras line is only the first humble beginning. Moreover, this line is operated at 132,000 volts, although it is so constructed as to permit the voltage to be raised to 220,000, after reinsulation, when conditions warrant. EDY VELANDER.

Stockholm, Sweden.

The Right Measure of "Going Value"

To the Editors of the ELECTRICAL WORLD:

Referring to the editorial in your May 6 issue in regard to the Supreme Court's decision in the Galveston case concerning "going value," it seems to me that it was perfectly reasonable to reject the early losses as the yardstick of this value in view of the fact that what was to be arrived at was the value at the present time.

Consider the case of two public utilities constructed in similar towns at the same time and costing about the same. Plant A ungraciously accepts such business as is brought to it, while plant B makes an honest effort to get all the business and give good service. The result is that plant A never earns a fair return, while plant B is without such a return for only a few years. Under the early losses measure, plant A has a larger going value than plant B, though its business is certainly not worth so much.

To my mind going value is the value of the business as distinct from the plant and is measured by what an ordinary good business man would pay *today* for that business. What that business has cost is no more a measure of its value than what the plant has cost. They are both indications of what it would cost today, and as such they are factors to be weighed in determining the value, but neither is a measure.

The best measure of the going value, in my view, is the judgment (or guess, if you please) of an experienced man as to what it would cost to attach that business today under conditions as they exist at present, modified by any prospective change of pronounced character during the time necessary to attach it.

F. V. GALLAUGHER.

Lake Charles Railway, Light & Water Works Company,
Lake Charles, La.

Production of Cold-Light Sources Not Over Yet

To the Editors of the ELECTRICAL WORLD:

In your editorial of May 6 concerning cold light you seem to refer to a type of cold-electrode negative-glow corona lamp that has recently been worked upon in Europe. I made this form of lamp in 1894, patented it and described it in a paper presented before the American Institute of Electrical Engineers in 1896, and I also made an improved form suitable for lower voltages in 1913, patented it and described it in a paper presented before the A. I. E. E. March 26, 1920, and also before the Illuminating Engineering Society convention at Rochester last October. You may also be interested in the article entitled "Gaseous Conduction Light from Low-Voltage Circuits" in the *General Electric Review* of July, 1920.

I also imported from Cuba about 1900 several dozen fireflies and reached the conclusion that the color of their light was not desirable and that a drop of water added to their dried luminous organs reproduced the glow, indicating that the light was due to chemical reaction and that the oxygen of the moisture was essential.

It seems to me that it would be appropriate for various writers on cold light to remember that in New York it was a common thing a dozen years ago to see some of the four miles of the long Moore light tubes with icicles pendent from them. It is true that the mechanical limitations of these tubes were emphasized by the advent of the improved incandescent lamp. However, the invention and production of new light sources can be likened to a game that is not over yet, and I am still very much alive. D. MCFARLAN MOORE.

Edison Lamp Works of General Electric Company,
Harrison, N. J.

Cost of Operating Diesel Engines

To the Editors of the ELECTRICAL WORLD:

It has been called to our attention that there is an error in one of the tables of our prime movers committee report, advance copy, for 1922. This table is quoted on page 1034 of the May 20 issue of the ELECTRICAL WORLD, and I am therefore advising you as to the nature of the error.

In item J of the table of "Cost of Operation of Ten Diesel Engine Plants, 1921," the figures in column headed "Repairs," etc., should be $18,773.81 instead of $118,773.81, and the figures in column headed "Total Cost" should be $53,814.99 instead of $253,814.99.

National Electric Light Association, W. J. CANADA,
New York, N. Y. Engineer.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

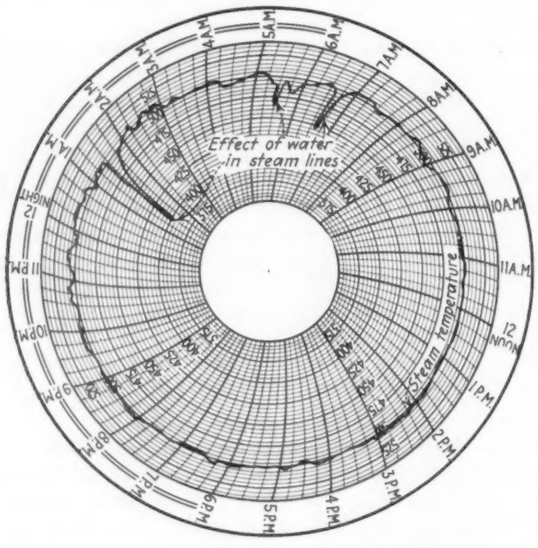
Proper Care of Boilers Prevents Water Going Into Steam Lines

IN MANY steam stations considerable trouble is experienced from water going over into the steam header, especially in those stations that are operated only a part of the day or where the load varies within wide limits, thus necessitating frequent cutting in and out of boilers. This water may cause serious damage to turbine blading, reciprocating engines, pumps and fittings. With proper care most of this trouble may be prevented. There are four principal reasons for this water going over into the main steam line:

1. When a boiler is on standby the steam condenses and water collects in the superheater, and this water will be sent over into the main steam line, unless care is taken to drain the superheater each time a boiler is started up.

2. If the water is being carried high in the boiler at light load and a sudden demand comes for more steam, water is apt to go over.

3. When the salt concentration in a boiler is allowed to become excessive the boiler will prime, especially if the water is high in the glass and the boiler is steaming at a high rate. It has been found that priming happens quite frequently if the salt concentration is allowed to get much over 200 grains per gallon, and



WATER GOING TO THROTTLE THROUGH STEAM LINES IS INDICATED BY LOWERED TEMPERATURES

whenever it is over this amount the boiler should be blown down. This blowing down must be watched closely if the efficiency is not to be affected. Too much blowing down—that is, keeping the salt concentrate too low—means a loss of heat in the water blown out, while not enough blowing will cause a loss from water going over into the steam lines.

4. Filling a boiler with water until it overflows into the steam line. It sometimes happens that when a boiler is being worked hard and the feed valve is well open the load drops and the fires are readjusted so that the boiler produces very little steam without the feed valve being properly closed to correspond to the boiler load, thus causing overflowing. Again, this may happen when a boiler is on standby. If the feed valve leaks and the blow-off valves are tight, the boiler will gradually fill up and the water go over into the steam lines unless close watch is kept.

Water going over into the steam line constitutes a serious condition, even though it is only of short duration. If severe enough, it will cause reciprocating engines and pumps to blow out heads or be otherwise wrecked. In the case of turbines the blades will be eroded and scale will be deposited on them, causing a permanent drop in the efficiency until such a time as the machine can be taken down for a general overhauling. If severe enough, the turbine blades will be distorted, if not torn out, and the machine thrown out of balance.

Another result is the "salting up" of valves, valve stems, burner lines, etc. While it is often impossible to estimate just what these losses amount to in dollars and cents, it is a fact that every time water enters the steam line there is a chance that some piece of the equipment will be damaged, if not wrecked, and that where turbines are used their economy will be lowered, if nothing more serious happens to them, and the loss will continue until there is an opportunity to take them out for overhauling and cleaning.

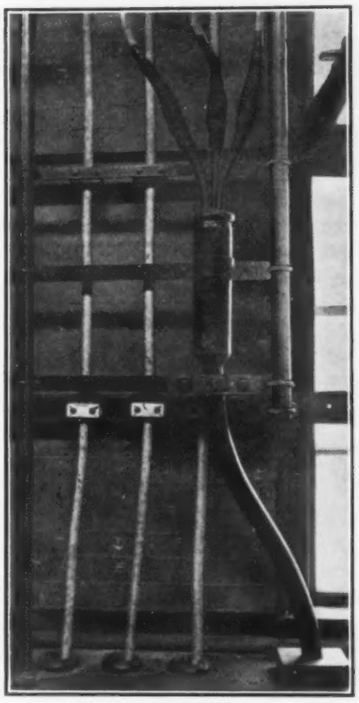
The accompanying illustration give some examples of water going over as shown on the recording steam temperature chart. In this particular station the load is usually off about 10 p.m. and the boilers kept on standby until about 5 a.m., when the load gradually comes on until about 8 o'clock.

W. E. THOMSON,
Steam Plant Engineer.
Southern California Edison Company,
Los Angeles, Cal.

Three-Conductor Cables Save Space in Substation

WHEN duct capacity is limited it may be advisable to install three-conductor cable instead of separate single conductors. This plan was followed recently in the Sewall Street substation of the Cumberland County Power & Light Company, Portland, Me. It had become necessary to increase the output of the station by running additional cables from the switchboard to the outgoing cable rack. The new 4/0 2,300-volt cables were installed as shown in the illustration. The old and new methods are shown side by side, and the compactness of the

three - conductor cable, which saves two ducts per circuit, is apparent. Leads from the station buses are brought overhead to a pothead at the top of the lead-covered cable, and a common frame of ¼-in. x 1½-in. strap-iron, fastened at the ends to vertical pipe framing, is used conveniently for the old and new lines. To take the weight of the lead-covered cable, it is clamped at the concrete sill as shown at the bottom of the photograph by a 6-in. x 5-in. x 1¾-in. split wooden block secured by ½-in. horizontal bolts, and a second clamp just below the pothead further adds to the mechanical strength of the installation. In place of porcelain cleats, the company uses in the new work 2,300-volt insulators which are clamped to the pine framing.



DUCT SPACE SAVED BY REPLACING SINGLE CONDUCTORS BY THREE-CONDUCTOR CABLES

FIELD EDITOR ELECTRICAL WORLD.

Boston, Mass.

Comparison of Five Diesel-Engine Generating Plants

SOME interesting data on operating costs, with particular attention to maintenance expense for five Diesel-engine generating stations, are given in the accompanying table. The figures are for the year ended Dec. 31, 1921, and were incorporated in the prime movers report of the recent N. E. L. A. convention at Atlantic City.

A study of the table discloses the fact that fuel oils of different specific gravity are used in these plants. The reason for this is that the plants having old-type units cannot use low-gravity fuel oils satisfactorily, while those with more modern Diesel engines are able to do so.

All of these plants received a much-needed overhauling during the past year. As a result the maintenance expenses are higher than they normally would be.

A number of statements were received from operators of Diesel-engine stations. After studying these statements, it is possible to emphasize the following points regarding this type of prime mover:

Reliability. — All operators agree that Diesel engines are entirely reliable for either continuous or intermittent service.

Efficiency.—The thermal efficiency of these engines is high; 34 per cent has been obtained.

Picking Up Load.—One operator calls attention to the time required from starting cold to synchronizing on the board. This is only from five to eight minutes, although he states that fifteen to twenty minutes should ordinarily be taken.

Maintenance.—Depending upon the continuity of operation, attention is called to the increase in cost of maintenance and replacement after several years of operation.

New York, N. Y. FIELD EDITOR ELECTRICAL WORLD.

COMPARISON OF OPERATING COSTS OF DIESEL PLANTS WITH PARTICULAR REFERENCE TO MAINTENANCE

Item No.	Data	Station A	Station B	Station C	Station D	Station E
1	Number, size and kind of Diesel units	Three 500-hp. M. & S. Diesels Three 350-kw. or 437-kva. G. E. generators	Four 225-hp. B-S Diesels One 250-hp. primary semi-Diesel Two 300-kw. or 375 kva. G. E. (F. W.) generators One 125-kw. or 150-kva. generator	One 500-hp. M. & S. Diesel One 500-hp. B-S Diesel Three 225-hp. B-S Diesel One 350-kw. or 437-kva. G. E. generator One 380-kw. or 475-kva. G. E. generator Three 150-kw. or 187-kva. generators	One 500-hp. M. & S. Diesel Two 225-hp. B-S Diesels One 170-hp. B-S Diesel One 380-kw. or 475 kva. G. E. generator Two 150-kw. or 187-kva. generators One 125-kw. or 150-kva. generator	One 500-hp. M. & S. Diesel One 350-kw. or 437-kva. generator
2	Total Diesel plant capacity, kw.	1,050	725	1,180	805	350
3	Gravity of fuel oil, degrees Baumé	22–26	28–36	22–36	22–36	22–26
4	B.t.u. per lb. oil (average)	19,200	19,200	19,200	19,200	19,200
5	Annual station output, kw-hr.	5,833,260	2,214,876	891,710	2,075,980	1,516,680
6	Maximum hours generation, kw-hr.	950	530	880	480	330
7	Peak load, kw.	980	620	920	585	350
8	Ratio average hour to maximum hour, per cent	70	47½	11½	49	52½
9	Ratio average hour to plant capacity, per cent	63½	35	9	29	49½
10	Ratio maximum kw. to plant capacity, per cent	93½	85½	78	73	100
11	Fuel used, total lb.	4,021,300	1,798,100	698,300	1,659,900	1,123,300
12	Average pounds of fuel per kw.-hr. output	0.689	0.812	0.783	0.800	0.740
13	Average B.t.u. per kw.-hr. output	13,230	15,600	15,030	15,360	14,210
14	Cost of lubricants per kw.-hr. output, mills	0.35	2.07	1.36	1.28	0.66
15	Maintenance of Diesels per kw.-hr. output, mills	4.45	10.39	9.67	10.15	9.77
16	Maintenance of electric equipment per kw.-hr. output, mills	0.05	0.15	0.54	0.15	0.15
17	Maintenance of auxiliaries per kw.-hr. output, mills	0.01	0.27	0.17	0.40	0.16
18	Maintenance station buildings per kw.-hr. output, mills	0.10	0.00	0.43	0.16	0.24
19	Total maintenance per kw.-hr. output, mills	4.61	10.81	10.81	10.86	10 32
20	Miscellaneous supplies per kw.-hr. output, mills	0.54	1.03	1.18	0.68	0.92

Motor-Driven Oil Well Reduces Monthly Power Cost from $1,800 to $253

ELECTRIC power for rotary drilling of oil wells has recently demonstrated its superiority over steam power as successfully as electric drive replaced steam some time ago in drilling with cable tools. In working up rotary-drive apparatus several trials were necessary to determine the best type of mechanical drive from the motor to the draw works. With a belted motor mounted on concrete foundations, not only did the belt give considerable trouble, but the concrete was shattered by sudden shocks such as were produced by the whipping action of the bit slipping past a boulder. Standard rotary chain was substituted for the belt, but the speed was too high for it. High-speed silent chain working on long centers had too much inertia for quick reversals. The outfit finally selected consists of a slip-ring motor of the induction type, with control, driving the line-shaft of the draw works through a gear and sprocket arrangement that constitutes a double speed reduction (Fig. 1). The rotary table is driven in the usual manner from the draw works, while the slush pumps are driven by a separate motor.

The electrical equipment used on the main drive of rotary rigs is the same as that used for standard cable tool drilling, with the exception that the sliding base and pulley of the motor are omitted. The motor is an adjustable varying-speed type with a wound rotor, the required speed range being obtained by the insertion of resistance in the rotor circuit. It has been found that the most desirable motor to use is one rated at 75 hp., 440 volts, three-phase, with a synchronous speed of 720 r.p.m. on 60 cycles, or 600 r.p.m. on 50 cycles. This horsepower has been found sufficient for all purposes in drilling under the usual conditions. With the type of motor described, gear and sprocket ratios are used that will limit the speed of the rotary table to

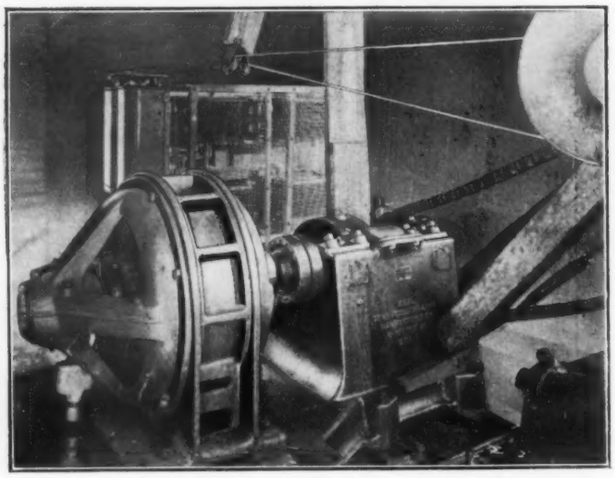


FIG. 1—75-HP. INDUCTION MOTOR WITH REDUCTION GEAR UNIT OPERATING STANDARD ROTARY DRILLING RIG

about 85 r.p.m. It has been proved by experience that the fishtail drilling bit will "make hole" in any kind of formation at this speed and that a 75-hp. motor is powerful enough to carry the load. Furthermore, the slow speeds necessary when using a rock bit of the cone or roller type cause a higher-powered motor to be operated so far down on the load curve that it has been found impossible to control the speed with any degree of accuracy.

The main-drive motor is handled by a main and an auxiliary controller, the former having eleven points for coarse speed gradations and the latter thirteen additional ones between any two adjacent points on the main controller, for fine adjustments. The two in combination give a total of 143 points. In rotary drilling with the fishtail bit the auxiliary controller is not employed, but it is necessary with the cone or roller bit in order to get the speed reduction wanted. When finishing

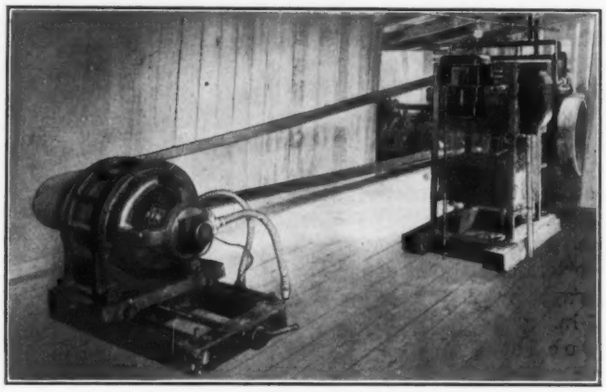


FIG. 2—INDUCTION MOTOR AND CONTROL FOR DRIVING TWO SLUSH PUMPS

the well with cable tools the large number of control points available is enough to obtain the exact speed desired at any time without danger of deadening the movement of the bit or overstraining the rig. The two controllers are placed where the driller can operate them easily by means of rope wheels close to him.

As for the mechanical drive of the rig, it consists of the usual draw works, with the line, or main shaft, driven by the motor through a set of cut-steel spur reduction gears, and a sprocket and chain on a short countershaft. The motor pinion is mounted on a short shaft which is connected to that of the motor by a flexible coupling and is carried in heavy bearings. The gear and driving sprocket are keyed to the countershaft, which also has heavy bearings. In addition the countershaft has an extension for a pulley that can be belted to the band wheel if it is necessary to use the outfit for cable tool work. The motor, gear train and countershaft are all mounted on a heavy cast-steel base which keeps them in proper alignment and is strong enough to withstand the severe shocks.

A gear ratio of about twelve to one is used. In order to limit the rotary table to the maximum speed of 85 r.p.m., it is customary to select a countershaft sprocket of suitable size to use with the minimum standard diameter of the line-shaft sprocket on the draw works. This prevents the table from being speeded up by the operator by substituting a smaller line-shaft sprocket.

This type of gear reduction on an electrically driven rig has a comparatively low inertia on the driving end, so that full advantage can be taken of the accurate speed control of the electric motor and of its ability to reverse rapidly. The latter is of particular importance in rotary drilling in case the bit strikes an obstruction, as quick reversing may save a twist-off with all the ensuing difficulties.

The slush pumps used with this type of rig are

driven by a separate 50-hp. induction motor, running at 720 r.p.m. on 60 cycles or 750 r.p.m. on 50 cycles. In practice the two pumps are placed with their pulleys adjacent, so that the belt will slip readily from one to the other. The motor is mounted on a sub-base that is adjustable parallel to its shaft, as shown in Fig. 2.

The pump motor has sufficient overload capacity for short periods to develop the power required for pump pressures of 900 lb. to 1,200 lb., which are required for such operations as forcing a plug out of the bottom. Its continuous capacity is ample for the lower pressures required for ordinary drilling operations and for cementing, without its being so underloaded as to sacrifice the accuracy of the speed control.

Regarding the comparative economy of steam and electric drilling, the general statement has already been made that the electric equipment is the most economical. To quote an "isolated case," which is nevertheless typical, a well in southern California was drilled by a standard rotary rig, driven by a 75-hp. induction motor, to a depth of 1,850 ft. in five weeks at a total cost for power and lights of $306.60, or an average cost of $245 per month. The well was finished to 4,300 ft. with standard cable tools, electrically driven, at an average cost of $253 per month, inclusive of lights, for the entire period of drilling operations. It happened that other wells in the vicinity were being drilled with steam, which furnished a fair basis for comparison. The average cost for fuel oil for the engines was $60 per day (40 barrels at $1.50 per barrel), giving an average cost of $1,800 per month, not including the cost of boiler feed water, as compared with considerably less than $300 for electric power. It is evident that the advantage is so greatly in favor of electric power that it would not be materially affected even by any variation in power rates existing in the different oil fields.

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Power and Mining Engineering Department.
General Electric Company,
Schenectady, N. Y.

Central-Station Equipment Costs

VARIOUS central-station equipment and installation cost data based on construction and purchasing done within the last two or three years in a number of Eastern properties are presented below. Although prices have decreased somewhat within the past two years in many lines of electrical material, these actual costs from practice are representative and are all based upon carefully recorded work sheets:

MISCELLANEOUS EQUIPMENT COSTS

One CO_2 recorder installed (factory cost $1,163)	$1,339.37
One 40-hp. constant-speed, 1,800-r.p.m., 550-volt, three-phase, 60-cycle induction motor, installed	475.46
Three 3,000-lb. side-dumping industrial coal cars with door control, delivered at plant	1,463.91

TRANSFORMER PRICES

Power Transformers, 2,200 to 575 Volts		Lighting Transformers, 2,200 to 220 Volts	
Seven 15-kw.	$1,362	Four 5-kw.	$341
Six 25-kw.	1,702	Nine 7.5-kw.	930
Two 37.5-kw.	646	Two 15-kw.	330
Three 50-kw.	1,206	One 25-kw.	328
Three 75-kw.	1,487	One 37.5-kw.	322
Three 15-kw.	494		

Battery Room and Equipment. — The following costs (omitting cents) cover expenses of building a battery room on the foundations of a 600-kw. turbo-generator and the installation of a 60-cell E-7 lead battery for remote-control operation:

Battery room	$1,714	Wiring and installation	209
Battery	1,196	Field engineering	403
Electrolyte, 1,380 lb.	37		
Battery control panel	264	Total	$3,935

Construction of Steam Plant Drain.—Installing main drain from station, 16-in. cast-iron pipe, 68 ft. long: Pipe, $98.74; labor, $122.64; liability insurance and miscellaneous, $1.05; total, $222.43.

Disconnection, Etc.—Disconnection and removal from service of one 275-hp. water-tube boiler, superheater and stoker; Labor, $494.14; total, $622.67.

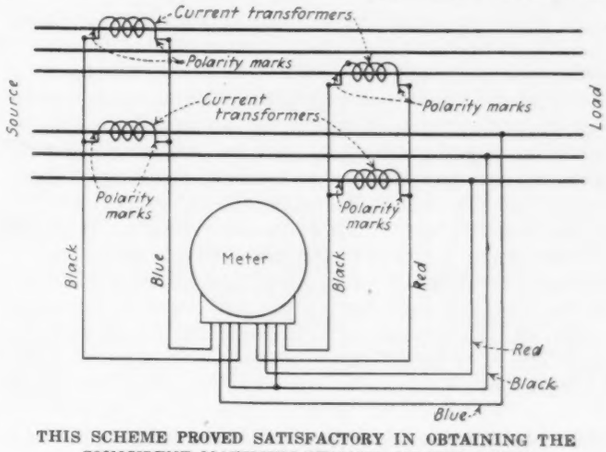
Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Paralleling Current Transformer Leads Facilitates Demand Metering

THE adoption of a maximum-demand schedule frequently makes it necessary to consolidate the metering of circuits which otherwise it is much more convenient to meter separately. Such was the case with a large industrial plant in Southern California which was supplied with power from two 60,000-volt lines. The 440-volt secondary circuits were tapped from two buses operated in parallel and fed from one or both of the main banks of transformers. Two meters were used, each with its current transformers connected in the 440-volt side of one of the transformer banks. The change in rate schedule made it desirable to replace these two meters with one which would indicate the combined demand.

The two sets of current transformers were left in place, and the secondaries of corresponding phases were paralleled through the new watt-hour demand meter. As the latter was of the usual 5-amp. rating, it was necessary to replace its series coils with a new set of 10-amp. capacity, thus doubling the meter constant. The diagram herewith shows the connections used.

In series with the primary of each current transformer is a testing link consisting of a bypass shunted around a joint in the busbar. This bypass may be opened up and a "through-type" standard current transformer slipped over the bar. By closing the bypass and opening the joint in the main circuit the standard meters are placed in series for an "over-all" test without interrupting the service. To test the single meter now installed it is necessary to cut in four standard current transformers, using either four single-phase or two polyphase rotating standard meters.



THIS SCHEME PROVED SATISFACTORY IN OBTAINING THE COINCIDENT MAXIMUM DEMAND ON TWO BUSES

Southern California Edison Co., H. R. THOMAS,
Los Angeles, Cal. Meter Department.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Broadening the Appeal of the Electric Home

By C. E. Greenwood
Superintendent Appliance Department,
Edison Electric Illuminating Company of Boston

TO CARRY the influence of the electric home continuously into the lives of the people in a territory served by a central station, something more is needed than a short-time exhibition of appliances in a specially prepared house. We should broaden the appeal by making it virtually permanent, constantly interesting and up to date.

From observation of the effect of many exhibits of appliances upon the general public, I am of the opinion that much would be gained through the establishment of a continuous electric home, underwritten by an organization of, say, a hundred concerns furnishing material and products entering into the modern high-grade house, located on an attractive and accessible site and maintained as a center of semi-social and semi-educational interest. Through a progressive real-estate house, such an organization might well lease a suitable residence and equip it with the latest and best-appointed fittings. It would not seem desirable or necessary to build a house for this purpose in view of the lower cost of leasing. Doubtless real-estate men would quite generally welcome an opportunity to increase interest in a particular neighborhood through the establishment in such a locality of a model home, and appropriations of, say, $100 per year per underwriter would accomplish a good deal in the way of specially directed advertising demonstrations.

If such an electric home, or, rather, model home (which would mean full electric equipment), were on a main thoroughfare traversed by great numbers of motor cars, trolley cars and other vehicles, to say nothing of pedestrians, it might be an excellent plan to maintain a tea room as a part of the establishment, turning the profits into general advertising. Many more visitors would certainly be attracted to the house, and the opportunities to show people about and call attention to its features and fittings would be increased. In some New England tea rooms old houses of the Colonial style have been put to use most attractively, and displays of antique furniture for sale on the premises have found many patrons. So in our model home, always kept up to date by the exhibitors, used by them as a sort of field demonstration station for their products, and provided with as many appliances of electrical nature as good taste and convenience allow, we could tie in the appeal to bodily refreshment with the fascination of more enduring comforts and combine the artistic and the commercial in displays.

In time such a home might easily become a center of interest from the standpoint of dietetics, household economics, interior decoration and so forth. It could be used as a sort of laboratory for demonstrating problems in electric cooking to students, housewives and others, or as a lecture center for a neighborhood. An incidental and valuable public relations result of such a co-operative display would be the closer understanding sure to develop between the central-station representative on the organization slate and the representatives of other industries and trades. Preliminary work on a plan along these general lines in Boston promises success when the time comes to give the scheme a comprehensive try-out.

Pacific Power & Light Builds Good Will with Educational Film

THE Pacific Power & Light Company of Portland, Ore., has recently completed a series of moving-picture shows which have been put on with great success. Two performances were given in four cities, The Dalles and Hood River, Ore., and White Salmon and Toppenish, Wash., and 2,810 people attended these eight performances. The show consisted of a series of colored lantern slides showing views of the power company's property and hydro-electric plants. The slides were accompanied by a lecture by Lewis A. McArthur, general manager of the company. In each of the cities Mr. McArthur was introduced by the local manager for the power company. Following the slides and the lecture, the motion picture film "Back of the Button" was shown.

FREE MOVIE!

Are you interested in your local Power & Light Co.?
If so do not fail to see this performance.

PROGRAM INCLUDES
Two Reels of Motion Pictures Featuring
"BACK OF THE BUTTON"
LANTERN SLIDES SHOWING
"The Character of Territory Served."
"Modern Electrical Construction."
"Heavy Construction."
"Safety First."
"Always at Your Service."

Slides are accompanied by a talk by Mr. L. A. McArthur, General Manager, Pacific Power and Light Company.

LOIS THEATER
TUESDAY, APRIL 4, 1922
Admission Free — Two Shows 4 p. m. and 8 p. m.

NEWSPAPER ADVERTISEMENT ANNOUNCING FREE "MOVIE" SHOW

All of the performances were free and each was extensively advertised, not only in the newspapers of each district but also with handbills distributed before the show reached each city. Officials of the company state that the good will accruing has already made itself felt.

Central-Station Company Installs Wireless Aërials for Radio Fans

THE Dayton Power & Light Company has adopted a definite policy in dealing with the installation of amateur wireless apparatus by establishing a radio service department. This department will put up the aërial required for service and thus avoid the liability of injury incurred by inexperienced persons attempting to erect wires in dangerous locations.

The company charges for the material used in the service but makes no charge for the labor used in erect-

ing the aërial. It also maintains an office in the company's headquarters to advise people regarding any phase of the radio work. The establishment of a new department of this kind commends itself to the public as it not only stands for safety but assures the public that the utility is always ready to meet its demand.

Frank Kendig, formerly a radio officer in the Sixty-second Field Artillery Brigade, is in charge of the Dayton company's radio service department.

The Opportunity for Electrical Dealers

THE vast field for the sale and installation of better lighting equipment that lies at the very doors of the electrical contractor-dealers is graphically depicted in the accompanying diagrams of typical business blocks in and about New York City. To obtain these statistics showing the existing conditions, surveys were made by the Lighting Sales Bureau of the N. E. L. A. in New York, Brooklyn and various cities in New Jersey to determine how effectively the electrical contractor is selling to the merchants in the immediate vicinity of his store.

These charts show the results of some of these surveys and represent not uncommon examples where prospective business is literally next door or around the corner from the dealer. In many cases it would appear that the "electragist" is sitting at his desk, like Micawber, "waiting for something to turn up." In several instances it will be seen that the dealer himself either does not appreciate the value of or does not know how to obtain proper illumination and thereby sets a bad example to his customers.

Today is a most opportune time to talk better lighting to the store proprietor. Business depression has, of course, hit retail stores, but they are not in a position to close up and wait for better times. Any reasonable plan to increase sales is therefore welcome to the store manager. Here is a field where the central-station company can build up its commercial lighting load and also do a real service for its customers.

What Other Companies Are Doing

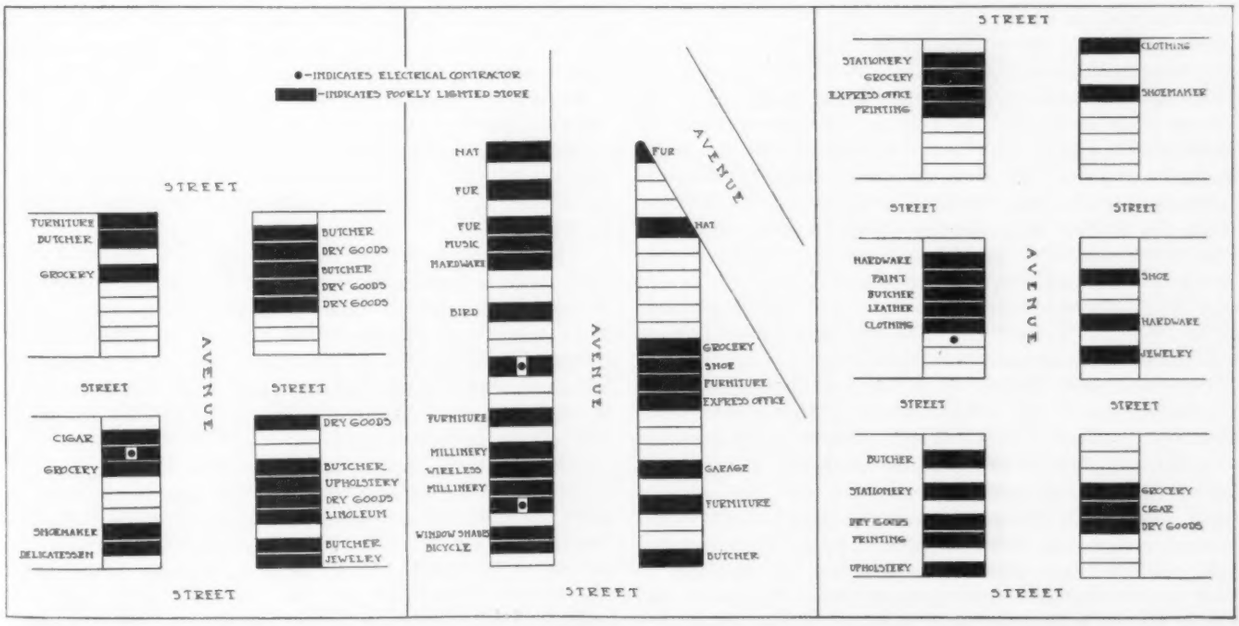
Pawtucket, R. I.—A good example of what the light and power company can do toward educating the public in details of its business is shown in the recent action of E. L. Milliken, assistant manager of the Blackstone Valley Gas & Electric Company, who has contributed gas and electric meters to the laboratories of the Pawtucket high school to be used for instruction and experimental purposes by the physics classes.

Milwaukee, Wis.—The "home electric" which was conducted in this city under the auspices of the Electrical Development Association of Wisconsin was closed on May 21, after being open to the public for twenty-two days. In that time a total of 15,577 persons visited the home and the average daily attendance was 708. Attendance was well sustained throughout the entire period, as 5,070 people visited the home the first week, 4,871 the second week and during the last eight days there were 5,636 visitors. Sundays proved to be the heaviest days, the attendance being two to three times that of the daily average.

Mattoon, Ill.—The Central Illinois Public Service Company sold this week 151 irons, eleven vacuum cleaners, fifteen washing machines, seven electric ranges, two lighting fixtures, one motor, one gas range and miscellaneous other merchandise for a total of $6,074.37.

Grand Island, Neb.—Appliances sold by the Central Power Company during the second week in May were six irons, two curling irons, one electric hotplate, two ceiling fans, one desk fan, three vacuum sweepers, one electric range, one percolator, one washing machine, one mangle, one tank heater, one gas range, one 7½-hp. motor and one 2-hp. motor. Five wiring contracts were secured. Merchandise sales for the week totaled $2,772.

Illinois.—During one week in May 538 new electric customers were connected to the lines of the subsidiary companies of the Middle West Utilities Company. The additional load connected amounted to 343 kw. for light and 336 kw. for power. New power contracts closed but not yet connected total 357 kw.



DIAGRAMS OF BUSINESS SECTIONS IN NEW YORK, BROOKLYN AND NEWARK, N. J., TYPICAL EXAMPLES OF OPPORTUNITIES WHICH SURROUND EVERY CONTRACTOR FOR BUSINESS IN BETTER STORE LIGHTING

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

The Only Way to Sell Appliances

By R. J. Strittmatter
Sales Manager Apex Electrical Distributing Company

DOWN at the bottom of the whole problem of appliance selling lies a fact that in the general discussion is often overlooked. It is this—that with the finest store location on Main Street, the best window display and the best possible advertising campaign, you cannot sell the larger appliances in sufficient volume out of a store to pay a profit on the cost of getting the customer into the store. On the other hand, one commission salesman properly organized and directed, working from house to house, demonstrating and creating demand, will bring in more actual business than all other influences combined, and at less expense because he is paid only for sales. But 95 per cent of the electrical dealers in the country are not in a position to obtain and operate retail salesmen. The dealer himself has never sold appliances from house to house and does not know what the commission man is up against.

R. J. STRITTMATTER

Moreover, the dealer, operating as he does in a small way, has nothing to hold out to the retail salesman in the way of promotion and future opportunity. But the young man entering the selling profession today is looking for opportunity ahead of his immediate remuneration. A man who does not enter with this thought in mind is not a man who will develop any big success.

In the matter of financing, too, the general run of contractor-dealer is not a business man. He knows little of merchandising principles and on top of this has not the finances necessary to do a big volume of business. Yet the dealer must have a good financial responsibility in order to carry on this business.

Our experience is that 80 per cent of the major appliance business is purchased on a time-payment basis. The dealer who sells for cash only, therefore, is securing only 20 per cent of the possible business. He cannot get a commission salesman to work for him on this basis, since he would starve to death, and he cannot get enough orders out of his territory to satisfy an aggressive manufacturer who is pushing for business. It is true that there are time-payment plans offered to the dealer for financing his retail paper, but these plans are only available to the dealer who has sufficient financial responsibility to pass the scrutinizing eye of these financing companies.

So we come to the jobber to see what he can do. The answer, as we see it, and as we have definitely proved to the satisfaction of many of our jobbers, is retail operation of house-to-house men working for the jobber and operating throughout the entire territory that he controls, co-operating with the dealers in that territory. The jobber must absolutely divorce his major appliance business — cleaners, washers, and ironers — from his supply business, and set this up on an independent footing, just as a distributor would who was organized merely to secure appliance business and had no other interest at stake.

Best Possible Co-operation

Our plan is for the jobber to set up such an independent department with a man at the head who absolutely knows the house-to-house selling profession, having himself grown up in this business from a retail salesman. This man then employs commission salesmen, educates them in the mechanical points of our appliances and sends them out into the territory to sell at retail in the various cities, selling on the jobber's paper. The jobber carries the account and finances this business, and the dealer secures a percentage on this business for the use of his store, his name and his good will.

Under this plan when the jobber goes out and sells at retail he does not eliminate the dealer. He gives the dealer the finest sort of co-operation he could possibly afford. He goes into the store of a dealer who has not been doing any business whatever in appliances, engages trained salesmen to operate out of the dealer's store and canvass every home in the city, acquainting the housewife with the fact that the John Jones Electric Company is the livest electrical dealer in the city and incidentally endeavoring to get a demonstration on the particular product that he is selling. He brings in a volume of business that is very profitable to the dealer, being on a percentage basis only with no expense attached to it.

This means that the jobber builds up a big organization of retail salesmen that are in his employ and not in the dealer's employ. They can be moved about from town to town as circumstances warrant in order to keep the men satisfied to go out and build up a volume of business for the distributor and manufacturer at a profit to dealers who previously were making no profit out of the appliance business.

The jobber is able to hold these men because he does a large volume of business and can apply methods of organization and education and provide an opportunity impossible in the case of the dealer. It entails, of course, a big stock of consigned appliances spread over the territory for the salesmen to work with, but this combination provides a volume of business that enables the jobber to succeed in a big way.

Overhead as a Test of Management

BY H. F. STRATTON*

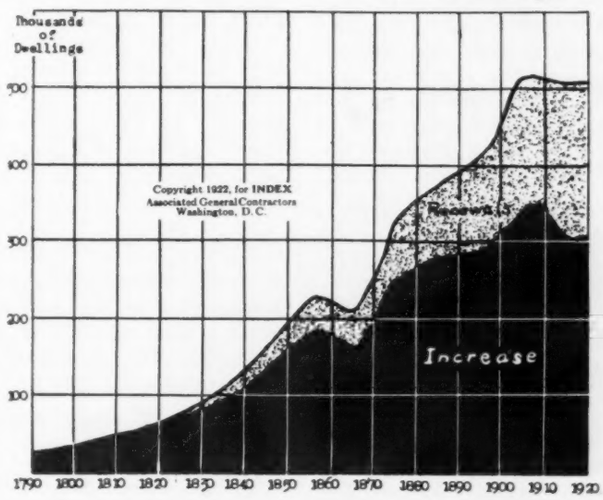
A LABORER can do about one-third of a kilowatt-hour of work per day; his mechanical output is worth one to two cents per day measured by current prices charged for electric power. It is quite evident that intelligence is the only human quality worth employment. Industry must inevitably develop toward the use of power for work and the use of persons for direction. This spells the concurrent decrease of direct or productive labor and increase of supervisory labor or overhead. Broadly stated, the manufacturer spends at least one-fourth of his entire revenue for overhead; profit, material and productive labor make up the balance.

Society, then, in developing from the state of peasant labor to the state of machine production, has reached a condition of spending about one-tenth of the entire national income for overhead. To a startling and unsuspected degree the test of management is now the management of overhead.

In manufacturing, overhead may roughly be defined as the sum of all expenditures not chargeable to assets, material or productive labor. It is, however, illuminating to reflect that one portion of overhead is definitely and proportionately associated with production, is absolutely needed for production, and will fluctuate at nearly the same rate as production. It is in reality almost a production expense. Illustrations are boxing, painting, testing, inspecting, freight and express, power, tool breakage, trucking. There are many others, but these are sufficient to bring out the point. They present no particular problem. They are not fixed expenses. A second type of overhead is represented by such items as insurance, bond interest and taxes on real estate. These belong more in the domain of finance than manufacturing. They are true fixed charges.

To make a superior product and convince the public of its superiority costs a lot of money. The position of admitted superiority moves from one competitor to another. Constant changes in product and price ensue. They are expensive in the factory and expensive to sell. Because of these expenses and because of competition, the pressure is strong and constant to reduce material and productive labor. Now material and productive labor is the very article itself. It is all that is left to the user after the sale is made. He has no equity in the sums spent for advertising and selling. These expenses were largely competitive, partly masquerading under the name of service. Competition has undoubtedly tremendously advanced the art and has reduced the cost of material and productive labor, but it has probably increased the cost to the consumer. Manufacturing has approached, if it has not already reached, the condition where the cost of competition exceeds the economy of competition.

Normal Demand for New Buildings



AFTER all, the demand for new buildings is dependent upon the natural influences of increase in population plus the requirements for replacement of demolished structures. This diagram shows what this amounts to in the United States.

THE NORMAL OVERHEAD BURDEN

As a result of these conditions, emphasized by the depression of 1921, accountants have discussed and some have approved the use of a so-called "normal overhead burden."

There are different formulas for its determination, although all appear to have the same philosophical picture of the conditions.

Normal production does not mean possible production. In many cases it does not even mean possible production less proper allowances for repairs and other ordinary hindrances to continuous operation.

Lacking scientific methods for determining the possible output from which to deduct allowances for all possible interruptions, the average business can at least establish its normal as the average of a certain number of years which the management considers representative of its business. If the several years preceding the war brought a volume of business to your plant that kept it as busy as you could ordinarily expect it to be, and there had been no material changes in the plant or methods, there appears to be no good reason why an average of these years should not be used to obtain the basis of a "normal" output. If a corporation in calculating overhead adopt a normal overhead based on some average degree of business activity, it will have a surplus or over-absorbed burden during prosperous years and a deficit or under-absorbed burden during depressions. If the present were an era of marked prosperity, it could conservatively be urged that the over-absorbed burden be transferred to a reserve account to meet the deficit later to be caused by an under-absorbed burden in the next depression. This not being such an era, accountants unanimously feel that any under-absorbed burden should not be carried as an asset, but should be carried to profit and loss at the end of the year.

In short, the overhead burden has now become the most elusive and probably the most expensive factor in manufacturing.

Its distribution in alternate good and bad years is arbitrary and does not square with the fundamental facts.

Therefore, it will be retrogressive and harmful if the manufacturers become vendors of competitive overhead expense at the sacrifice of inherent merit in their product.

*Chairman cost accounting committee. Abstract of a report presented before the Electric Power Club at its Hot Springs (Va.) meeting, June 5-9, 1922. Embraced in the expanded report were quotations from the *American Machinist* and a bulletin of the Chamber of Commerce of the United States discussing this subject.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

The Design of Fractional-Horsepower Motors.—W. J. JOHN.—Various motor designs are treated theoretically, the article dealing with commutator losses, length of air gap, magnetic circuits and design of field coils and concluding with the complete design of a ½-hp. shunt motor.—*Beama*, March, 1922.

Regulating Voltages on a Three-Wire Direct-Current System.—R. D. ARCHIBALD.—A method is described for regulating and equalizing the voltages on the two sides of a three-wire direct-current system by static balancers. The merits of this balancer are compared with those of rotary balancers, the chief disadvantage of the former being that the voltage on the two sides of the three-wire system cannot be regulated without the aid of a mid-wire booster. In the static balancer system this disadvantage can be overcome by the use of taps other than the central point of the winding of the balancer.—*Journal of (British) Institution of Electrical Engineers*, March, 1922.

Static Condensers for Power-Factor Improvement.—M. MISSEREY.—The author describes the benefits derived from the extensive use of static condensers in several industrial plants in France. It is claimed to be more advantageous with small and medium-size motors to use a small condenser directly at the terminals of each motor than one large battery of condensers at the high-voltage side of the supply transformer. A short theoretical explanation is given of the possibility of over-voltage. Several charts are shown, indicating the conditions of different plants before and after the introduction of condensers.—*Revue Générale de l'Electricité*, April 8, 1922.

Lamps and Lighting

The Use of Light as an Aid to Aërial Navigation.—L. F. BLANDY.—The high speed attainable by aërial traffic may be lessened or even neutralized if the aircraft has to lie idle at night. Consequently the use of artificial light in connection with aërial navigation is a very important problem—one on whose solution the future of the craft largely depends. The paper treats of the use of light on airships and in aërodromes and of the construction of aërial lighthouses. In view of the high speed at which airships now travel the lights attached to them need very careful design. The problem of sufficient intensity with absence of glare is not easy to meet. The lighting of the quarters for passengers and crew on board aircraft is also a vital matter. Aërodrome lighting presents a variety of aspects, including the use of light to indicate the presence of obstructions and the lighting of the actual ground of the aërodrome. One of the most interesting sections of the paper is that dealing with aërial lighthouses and local pilotage lights. The former indicate the route to distant travelers, while the latter act as a guide to aviators approching their destination. Both classes of lighting have been studied with great care, and the collected data indicate that considerable progress has been made.—*Illuminating Engineering (London)*, Vol. 15, No. 2.

Traction

Suppression of the Inverse Current in Mercury Rectifiers.—C. JOTTE.—The frequently occurring short circuits between the two anodes of mercury rectifiers threatened for a long time to limit their use to a maximum of 500 volts direct current. A process is being used by one company for preventing short circuits by employing an external direct-current magnetic flux, entering through the vessel at the mercury cathode, which causes a constant rotation of the arc and thus prevents overheating of the electrode. Another company builds its vessels so as to form separating walls around the cathode and conical screens inclosing the anodes. As gases favor the establishment of a short circuit between the anodes, the author suggests building the vessel so that it will taper toward the top and making the connection between the vessel and a vacuum pump at the apex of this conical vessel, so that all foreign gases will accumulate at a point where they can be readily removed by the pump. In addition, a water-cooling chamber is used around the upper part of the vessel and a metallic cylinder surrounds the cathode spot. Results with such a rectifier were very satisfactory.—*Revue Générale de l'Electricité*, March 4, 1922.

Installations, Systems and Appliances

A New Electric Furnace for the Manufacture of Steel.—ALFREDI STROMBOLI.—One-sixth of the steel-making industry in Italy is dependent on electric furnaces, and their product has grown from 20,000 tons in 1915 to more than 130,000 tons in 1921. With a new Fiat furnace which has given excellent results the electrode consumption, reckoning from the cold charge, has been reduced to 3 kg. per ton of steel and the consumption of energy to less than 650 kw.-hr. per ton. Simultaneously a saving in labor and in refractory materials has been effected. In a furnace rated at 5 tons or 6 tons, in service five years, the total time necessary for fusion has been reduced to two hours. These results have been obtained principally by means of the Fiat economizer, which permits the hermetic sealing of the roof of the furnace and hence prevents the escape of gases. Nine charges can be made by hand in twenty-four hours in a 6-ton furnace so equipped. Energy is fed to the furnace three-phase, the hearth acting as a conductor. The connections of the transformer secondary are made in star, each of the three points corresponding to an electrode. From the center of the star connection is made with the hearth and with earth. A copper plate increases the conductivity of the hearth. Numerous installations of this system have been made in Italy, especially notable among them being one at Turin which contains six furnaces rated at 20 tons. This plant is able under normal conditions to

produce 1,000 tons of metal a month, the pieces varying in weight from 1 kg. to 30 tons. Almost all the product is reheated at 900 deg. C., there being four furnaces used for this purpose, each capable of reheating 20 tons of castings.—*Le Génie Civil*, April 15, 1922.

The Electric Furnace in the Iron Foundry.—L. C. JUDSON and H. P. MARTIN.—A bibliography of practically all the articles appearing on this subject during the past five years. The list is confined to articles concerning the production of iron for the foundry, and all articles relating to the separate field of iron smelting have been excluded.—*Paper presented before American Electrochemical Society at Baltimore*, April 27, 1922.

Electrophysics and Magnetism

X-Ray Studies on the Crystal Structure of Steel.—ARNE WESTGREN and GOSTA PHRAGMEN.—Elaborate investigations for determining the crystalline structure of iron and steel have been carried out by the authors under improved experimental conditions, with which they obtained photograms clear enough for reproduction. The results are given with several tables and photographs. The X-rays were produced in a tube of the Siegbahn type with the anti-cathode cut off perpendicularly to its axis and an iron plate soldered to it. Around this anti-cathode five windows were made, which gave beams for making five exposures simultaneously. Through a regulating arrangement the pressure in the X-ray tubes could easily be kept constant at any state and the tube operated at any voltage desired. It was usually charged with 45,000 volts to 50,000 volts and run with 10 milliamperes to 12 milliamperes.—*Engineering*, May 19, 1922.

Electrochemistry and Batteries

Manufacture of Pig Iron Electrically from Iron Ore.—R. C. GOSBROW.—A comparison is made between shaft and open-top furnaces used in this industry. The electric smelting of iron ore brings into consideration certain features of furnace design which are particularly applicable to this art. The author describes the development of the various types of furnaces, concluding with production cost data.—*Paper presented before American Electrochemical Society at Baltimore*, April 27, 1922.

Electrochemical Plant at Lannemezan.—I. WATERNAUX.—For the production of calcium carbide, cyanamide and nitric acid for war purposes, a large electrochemical plant was erected by the French War Department at Lannemezan at the beginning of the war. A combined daily output of 200 tons was provided for. The plant buys all its power from a number of generating stations, which feed into a 63,000-volt, three-phase trunk line. In three substations within the chemical establishment a total transformer capacity of 130,000 kva. is installed and is in operation. A double transformation is used, the first step being from the trunk-line voltage to 12,500 volts, and the second step, in the furnace transformers, to 100 volts. All transformers use single-phase water-cooled units of from 2,500-kva. to 6,700-kva. rating. The entire electrical switching transforming and distributing system is installed within buildings and is remotely controlled from a centralized bench-type switchboard. A permanently installed transformer-drying and oil-filtering apparatus helps materially to prevent failures of the transformers and oil switches. Detailed transformer data are given.—*Revue Générale de l'Electricité*, April 22, 1922.

Units, Measurements and Instruments

The Effect of High Currents on Disconnecting Switches.—H. C. LOUIS and C. T. SINCLAIR.—A number of tests have been made by the authors on disconnecting switches with the object of studying the effects of high currents on this class of apparatus. The principal points observed were (a) the lowest value of current at which a switch blows open, (b) time required for the switch to open, and (c) cause of the failure of the lock on the switch, if one is provided, and the remedy. Switches of different manufacture and of various designs were tested. The investigations clearly demonstrate that some form of lock should be provided. It was noted from a study of the oscillograms that a switch seldom required more than one cycle to open, one-half cycle usually being enough.—*Journal of the A. I. E. E.*, April, 1922.

Researches on Impulse Voltage.—S. BEKKU and O. TANNO.—The authors carried out a series of experiments on the needle and sphere-gap discharges. Studies were also made on insulation breakdown of several fibrous insulating materials where there was induced impulse voltage in the secondary caused by sudden connection of the primary of a transformer to a direct-current source.—*Journal of Institute of Electrical Engineers of Japan*, April, 1922.

Telegraphy, Telephony and Signals

Proposed Revision of National Electrical Code Rules on Radio Equipment.—The proposed changes refer to the antenna, lead-in wires, protective device, protective ground wire, wires inside buildings, and receiving-equipment ground wire for receiving stations. The changes for transmitting stations apply to the antenna, lead-in wires, protective grounding switch and ground wire, operating ground wire and protection from surges. Receiving lead-in wires are to be of copper or approved copper-clad steel and shall in no case be smaller than No. 14 B. & S. gage, except that approved copper-clad steel not less than No. 17 B. & S. gage may be used. While the use of an antenna grounding switch is desirable a 500-volt lightning arrester is satisfactory. The size of protective ground wire is the same as stated under lead-in wire.—*Letter Circular No. 62, Bureau of Standards, Washington, D. C.*

Definition of the Output of a Vacuum Tube.—G. BEAUVAIS.—The author mentions the great variance in the customary ratings of vacuum tubes. An example will illustrate his point. Assuming a tube with a plate output of 250 watts, this means that 250 watts is transformed into heat on its plate. To this can be added 30 watts to 50 watts absorbed in the filament to give a total heat output of 280 watts to 300 watts. This tube may be used on a set with 600 watts additional output, so that 300 watts may flow directly to the antenna at constantly depressed key. In telegraph service this tube may easily carry double this energy. It is therefore possible to call this particular tube a 250-watt, a 600-watt or even a 1,200-watt bulb. The author suggests standardizing the tube ratings by calling the above bulb a 250-watt plate and 40-watt filament-output tube.—*Radioélectricité*, March, 1922.

Miscellaneous

The Theory of Water Hammer.—CARLO FOSSA MANCINI.—A mathematical treatment, with tables and diagrams, outlining a method of calculating the maximum force of water hammer in a given installation.—*L'Elettrotecnica*, April 15, 1922.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

ALTERNATORS, HIGH-SPEED, WINDAGE AND LOAD LOSSES IN.

Research work is being done by a radically different method of heat removal from that used at present, in order to eliminate a large part of the windage losses. At the same time we are making a more determined effort than ever before to discover the exact location of the losses that constitute load losses and to find out, if possible, how to build machines so as greatly to reduce these losses. It has been generally supposed that load losses are almost entirely located in the windings and are due to eddy currents in the conductors. Such is not the case, and we hope by certain investigations that we have undertaken to learn exactly where these losses occur.—*W. J. Foster, Schenectady, N. Y.*

RHEOSTAT, INCREASING THE CARRYING CAPACITY OF.

In a rheostat used for controlling a current it often happens that only a small part of the resistance is in the circuit when the current is the largest. A scheme has been devised whereby both ends of a rheostat can be used in parallel with larger current, thus doubling its carrying capacity and making regulation easier and more accurate.—*W. E. Forsythe, Nela Research Laboratories, Cleveland, Ohio.*

TRANSFORMERS, HOT-SPOT INDICATORS FOR.

A current transformer is mounted inside the case of the power transformer. The primary is connected to one of the main windings, and the secondary is closed through a heating coil. This coil is so proportioned and insulated that its temperature above the oil in which it is immersed is the same as that of the main coils. The temperature is measured by a thermometer of the thermocouple or Wheatstone-bridge type. A 10 deg. C. hot-spot allowance, required by the A. I. E. E. Standards, may be made on the thermometer dial.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

INDUCTION GENERATORS, SHORT-CIRCUIT CONDITIONS IN.

An investigation is being made and oscillograms are being taken of the transients obtained upon short-circuiting a three-phase induction generator. There seems to have been some question as to what actually occurs under these conditions, and the work has for its object the clearing up of the doubtful points and of the mathematical solution of the problem, including as far as possible all details of the machine construction which might affect the results.—*Massachusetts Institute of Technology, Cambridge, Mass.*

ELEVATOR MOTORS.

The elevator motor manufacturers report considerable development. One manufacturer mentions a pole-changing motor with a speed ratio of eight to one which is being developed for commercial installation. Other manufacturers report modification of direct-current elevators, such as conversion to multi-voltage direct current or available direct-current voltage, in order to accomplish speed changes economically on direct-current elevator equipment. With the exception of multi-voltage direct current, these methods are as satisfactory for alternating current as for direct-current supply.—*Electrical Apparatus Committee of the N. E. L. A.*

CORONA DISCHARGE, PRESSURE INCREASE DUE TO.

Large ions, electrified aggregations of gas molecules, are formed by the corona which is produced by excessively high potentials on power-transmission lines. These ions, driven away from a conductor by the electrical field, produce an appreciable wind when the conductor is in the open air, and when it is inclosed in a cylinder there is a measurable rise of gas pressure. This pressure, not due to the temperature rise on account of the heating of the wire by the current, amounted in some tests to 3 cm. of water. Theoretical computations were made with the results of measurements obtained using direct current only, but there is qualitative confirmation with the use of alternating current, showing that the pressure rise is due to exceedingly large ions having small mobility.—*Jacob Kunz, University of Illinois, Urbana, Ill.*

IRON LOSSES, DETERMINATION OF, ON SMALL SAMPLES.

The standard apparatus (Epstein) for the determination of core loss of a sample of steel laminations, by the wattmeter method, requires 10 kg. of iron. There are special cases of expensive or rare steels when such a large quantity cannot be had. A method has been recently proposed (*Elettrotecnica*, Vol. 8, 1921, page 519) which requires only 350 grams of sheet steel, and with which the losses in the unknown sample are determined by comparison with a known sample. A further study and adaptation of this method to industrial conditions is desired.

INDUCTANCE COILS, CAPACITY EFFECTS OF.

On account of the importance in radio communication of capacity effects in inductance coils, careful studies of these effects, both theoretical and experimental, have been made at the bureau. An interesting result is as follows: Let two condensers in series be connected across the terminals of an inductance coil and let the common terminal of the two condensers be grounded. If the inductance coil possesses capacity to ground, the familiar criterion for resonance in the system, computed from the known value of the capacities of the two condensers, will not apply. These and other results will be found in Scientific Paper No. 427 of the Bureau of Standards, Washington, D. C.

WIND PRESSURE ON OVERHEAD LINES.

The pressure of the wind upon cylindrical conductors, when blowing at an angle to the line other than 0 deg. or 90 deg., is being investigated. This research is being carried out in a wind tunnel where wind velocities can be controlled and measured. —*H. L. Dryden, Bureau of Standards, Washington, D. C.*

REFLECTION FACTOR OF MAGNESIUM CARBONATE.

Careful tests indicate that the reflection factor of magnesium carbonate in blocks, such as are frequently used in photometry, is as high as 98.7 per cent, corroborating some recent determinations by others. The value for magnesium carbonate has until recently been assumed to be 88 per cent. All blocks of magnesium carbonate, as ordinarily purchasable, have not so high a reflection factor. They may vary by several per cent.—*Enoch Karrer, Bureau of Standards, Washington, D. C.*

CONDUCTIVITY DETERMINATIONS, BY A VISUAL METHOD.

The balance point of an alternating-current bridge is indicated by a direct-current galvanometer in an audion circuit. The method is independent of the frequency impressed on the bridge, thus extending the usable frequencies above the present upper limit of 3,000 cycles per second. When an electrolytic cell was used as one arm of the bridge no difficulty was experienced in balancing with frequencies up to 15,000 cycles per second. The frequency applied to the bridge is not limited by the characteristics of the human ear. The strain on the observer incidental to all telephone methods is eliminated. Readings could be repeated to one part in 50,000 with a galvanometer of only 1 megohm sensibility.—*F. M. Kannenstine and E. E. Rosaire, University of Chicago.*

Apparatus Available

HIGH-TENSION LABORATORY.

A 1,000,000-volt laboratory has been recently completed which consists of a building specially designed for the purpose with adjacent yardage for outdoor tests. The equipment consists of a 1,000,000-volt transformer with all the necessary equipment for control of voltage and equipment for testing transformers, switches, line insulators, model structures, materials, etc. The testing transformer is rated at 1,000 kva. from one terminal to ground, although it will give much more than this for a short period of time. The laboratory is on the lines of the Duquesne Power Company sufficiently near the new Colfax Station to permit power testing to any desired amount. —*Westinghouse Electric & Manufacturing Company.*

Suggestions for Research

ANTENNA, MULTIPLE.

In an antenna consisting of several conductors the individual capacitance, and consequently the charging currents, of the various wires are different from each other. The corona loss may also be quite different. It is desired to devise an arrangement of the wires with which the charging current per wire will be as nearly as possible the same for all the conductors.

OVERHEAD LINES, RULES FOR CONSTRUCTION OF.

There is great need of data with reference to lines which have failed and those which have not failed in severe weather. Several states have already adopted rules for overhead-line construction, while others contemplate such action soon. The requirements of the National Electrical Safety Code are those generally adhered to.—*Bureau of Standards, Washington, D. C.*

TURBO-ALTERNATORS, STRAY LOSSES IN.

High-speed machines show a relatively high stray loss on test, sometimes running as high as four or five times the stator copper loss. Some of it is, of course, represented by eddy-current loss in the stator conductors, but this is a relatively small part of the total. A considerable part is in the frame and end bells. There is room for investigation as to the location of these losses and the best means to be taken to reduce them.—*R. B. Williamson, Milwaukee, Wis.*

INDUCTION MOTOR, SEPARATION OF PRIMARY FROM SECONDARY LEAKAGE INDUCTANCE.

In the exact equivalent performance circuit of the induction motor the exciting admittance is placed between the primary and the secondary leakage impedance. Therefore it is necessary to be able to separate experimentally the primary from the secondary leakage reactance. The same is true when an exact circle diagram is used, the so-called Ossonna circle. A short-circuit test and an open-circuit test alone are not sufficient to separate the two reactances, and it is desired to develop an additional simple test for this purpose.

ALLOYS, TEMPERATURE COEFFICIENT OF.

We can make alloys with virtually a zero temperature coefficient, but the reasons for this have not been made clear. If we knew more about this subject, it would probably be possible to use cheaper materials for many applications, such as the ordinary cast-iron resistor grid, of which millions are used every year. This is an entirely unsatisfactory article from a mechanical standpoint and would be replaced by something else of a stronger nature if a cheaper material were available. —*Wilfred Sykes, Steel & Tube Company of America, Chicago.*

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Supreme Court Defines Congressional Powers in Regulating Coal Mining

IN THE unanimous opinion of the United States Supreme Court, delivered by Chief Justice Taft last week, that labor unions may be sued in federal courts for violation of laws, the court took occasion to define the extent to which Congress may legislate in the matter of coal mining. The court said on this point:

"Coal mining is not interstate commerce, and the power of Congress does not extend to its regulation as such. The mining of coal is not interstate commerce, nor does the fact that it is to be afterward shipped or used in interstate commerce make its production a part thereof. Obstruction to coal mining is not a direct obstruction to interstate commerce in coal, although it, of course, may affect it by reducing the amount of coal to be carried in that commerce. If Congress deems certain recurring practices, though not really part of interstate commerce, likely to obstruct, restrain or burden it, it has the power to subject them to national supervision and restraint. It has the power to punish conspiracies in which such practices are part of the plan to hinder, restrain or monopolize interstate commerce. The intent to injure, obstruct or restrain interstate commerce must appear as an obvious consequence of what is to be done or be shown by direct evidence or other circumstances."

Radio Bill Introduced in House

A BILL to regulate radio operation has been introduced in the House of Representatives by Representative White of Maine. This bill, which is indorsed in its substance by the recent radio conference called by Secretary Hoover at the instance of the President, leaves the act to regulate radio communication approved Aug. 13, 1912, as the basic law upon this subject, amending it only so far as is deemed necessary to carry out the recommendations of the conference designed to meet the situation caused by the enormous expansion of the wireless art. The bill grants enlarged powers of regulation, clarifies ambiguities in the present law and adds a number of sections of minor consequence.

It asserts federal control over radio communication between the states and with foreign countries and requires that no such communication shall be carried on without a license from the Secretary of Commerce. It establishes twenty different classes of transmitting stations with appropriate wave allocations to each and specifies the nature of the service to which each class of station shall be limited. This classification does not, however, exclude the establishment of still other classes of stations. Undue interference by the military and naval stations of the government with private senders is provided against. The Secretary is authorized to refuse a license to any person or corporation seeking, in his judgment, to monopolize radio communication. Licenses are to be for ten years or less, with privilege of renewal, but there shall be no vested property in them or in the wave lengths authorized. A 200-meter wave length is set aside for amateur operators.

Public Service Commissioners of Oregon Recalled

FRED A. WILLIAMS and Fred G. Buchtel, two of the three Public Service Commissioners of the State of Oregon, were recalled by a majority of about three to two at a special recall election held May 19. T. M. Kerrigan and Newton McCoy of Portland were the successful recall candidates against Messrs. Williams and Buchtel.

The recall was invoked against these commissioners because of dissatisfaction arising out of a decision handed down by the commission granting substantial increases in telephone rates throughout the state to the Pacific Telephone & Telegraph Company. It is reported that the new commissioners have declared their intention to reduce telephone, gas and street-car rates immediately. If drastic action is taken along these lines, it is almost certain that an appeal to the Supreme Court of the state will follow. A peculiar phase of the election was that although Buchtel was recalled by a substantial majority, Williams was defeated by a small plurality only, indicating that the voters did not thoroughly understand what they were voting on. Oregon is one of the few states in the Union which have a recall law, and this is the first time the recall has been invoked against a public official.

California State Ownership Amendment Condemned by Bankers

A RESOLUTION was passed by the board of governors of the Investment Bankers of America at a recent meeting strongly condemning the project for state ownership of water powers which is to be submitted to the voters of California next fall. After reciting the provisions of the proposed act, the resolution declared that the board of governors "looks with consternation upon the proposed amendment as threatening, not only the destruction of the credit of existing privately owned hydro-electric, power and light utilities built up within the State of California by the combined capital of a multitude of investors residing throughout the United States who have been induced by the wise laws and sane regulation heretofore existing to intrust their savings to the development of California's natural resources, but even the destruction of the credit of the State of California itself."

Illuminating Engineering Society Elects Ward Harrison President

FROM the general offices of the Illuminating Engineering Society comes the information that the following will be the officers of the organization for the fiscal year beginning Oct. 1, 1922:

President—Ward Harrison.

Junior past-presidents—George H. Harries and George S. Crampton.

Vice-presidents—F. M. Feiker, William J. Drisko, Otto L. Johnson and G. Bertram Regar.

General secretary—Samuel G. Hibben.

Treasurer—Louis B. Marks.

Directors—F. C. Caldwell, A. D. Curtis, P. S. Millar, Adolph Hertz, Walton Forstall, Frank S. Price, F. R. Barnitz, Clarence L. Law and A. L. Powell.

Section chairmen—New York, A. L. Powell; New England, Roy R. Burnham; Philadelphia, Howard Lyon; Chicago, A. L. Anenberg.

Section secretaries—New York, James E. Buckley; New England, C. A. Strong; Philadelphia, H. Calvert; Chicago, F. A. Rogers.

The president of the society, the last three vice-presidents named, the general secretary, the last three directors and all the section chairmen and secretaries except Mr. Calvert are newly elected.

R. J. Russell Elected President of Electric Power Club

AT THE final session of the Electric Power Club's meeting at Hot Springs, Va., last week A. H. Timmerman of the Wagner Electric Manufacturing Company of St. Louis was elected to the board of governors of the club, succeeding A. L. Doremus of the Crocker-Wheeler Company. James Burke, E. R. Harding and H. F. Stratton were re-elected to the board. The terms of the other members of last year's board will not expire until 1923 and 1924. The board at its meeting re-elected R. J. Russell of the Century Electric Company, St. Louis, as president, J. K. Bass as treasurer, C. H. Roth as secretary and S. N. Clarkson as executive secretary, and elected T. E. Barnum of the Cutler-Hammer Manufacturing Company as vice-president.

The Power Club passed a resolution favoring the "American valuation" plan as a basis of assessing duty on imports. The board decided to hold the fall meeting at Asheville, N. C., and set a tentaive date late in October or early in November.

New York State Committee on Public Utility Information Formed

ANNOUNCEMENT is made by M. S. Sloan, president of the Brooklyn Edison Company, that the New York State Committee on Public Utility Information has been formed by the electric and gas companies of the state and has opened offices in the Grand Central Terminal, New York City. Mr. Sloan is its chairman; H. L. Mann, treasurer of the Buffalo General Electric Company, its vice-chairman; W. J. Welsh, president of the New York & Richmond Gas Company, its treasurer, and C. H. B. Chapin, secretary of the Empire State Gas and Electric Association, its secretary. The director of the committee will be Frederick W. Crone, who was for many years a news and editorial writer on the New York *Tribune* and who has had experience in publicity work. The organization of this committee raises the number of states having such bodies to twenty-five, or fifteen more than a year ago.

"It is the purpose of this committee," says Mr. Sloan, "to foster and increase existing good will between gas and electric companies and their customers. If, as may be in some instances, good will does not now exist, it is the purpose of this committee to endeavor to create it. The plan is to obtain the widest possible publicity for all facts concerning the gas and electric industries, both through newspapers and pamphlets and through speakers at meetings. We shall soon begin publication of a weekly bulletin for distribution to newspapers, commercial and civic clubs, company executives, and other individuals and institutions capable of being interested."

Electric Power Club Preferred Standards of Transformer Ratings

AS MENTIONED in these columns last week, the Electric Power Club at its meeting in Hot Springs, Va., approved the recommendations of the Transformer Section that certain of the standard transformer ratings be called "preferred standards" and that these preferred standards be adopted as "recommended practice to take effect Jan. 1, 1923."

The accompanying tables show the present standards of single-phase distribution transformers and single-phase power transformers, and those marked with an asterisk in these tables are the preferred standards.

TABLE I—PREFERRED STANDARDS, SINGLE-PHASE DISTRIBUTION TRANSFORMERS

[The Preferred Standards—both voltages and kva. sizes—are designated by an asterisk (*).]

	Standard Circuit Voltages								
	440*	550	2,300*	4,600	6,600*	11,000	13,200*	22,000	33,000*
Standard Kva. Sizes in Each Voltage Class	1½	1½	1½	1½	1½	.....	.....	.....	.....
	.....	.....	.....	.....	.....	2½	2½	.....	.....
	3*	3*	3*	3*	3*	.....	.....	.....	.....
	5*	5*	5*	5*	5*	5*	5*	5	.....
	7½	7½	7½	7½	7½	.....	.....	.....	.....
	10*	10*	10*	10*	10*	10*	10*	10	10
	15*	15*	15*	15*	15*	15*	15*	15*	15
	25*	25*	25*	25*	25*	25*	25*	25*	25*
	37½	37½	37½*	37½	37½*	37½	37½	37½	37½
	50*	50*	50*	50*	50*	50*	50*	50*	50*
	75	75	75*	75	75	75	75	75	75
	100*	100*	100*	100*	100*	100*	100*	100*	100*
	.....	.....	150*	150	150	150	150	150	150
	.....	.....	200*	200*	200*	200*	200*	200*	200*

Note.—In selecting standard transformer voltage ratings for operating from standard circuits, refer to Table I, Reference Number 9,015, "Electric Power Club Handbook."

TABLE II—PREFERRED STANDARDS, SINGLE-PHASE POWER TRANSFORMERS

[The Preferred Standards—both voltages and kva. sizes—are designated by an asterisk (*).]

	Standard Circuit Voltages						
	2,300*	4,600	6,600*	11,000	13,200*	22,000	33,000*
Standard Kva. Sizes in Each Voltage Class	250	250	250	250	250	250	250
	333*	333*	333*	333*	333*	333*	333*
	400	400	400	400	400	400	400
	500*	500*	500*	500*	500*	500*	500*
	.....	.....	667*	667*	667*	667*	667*
	.....	.....	883*	883*	883*	833*	833*
	.....	.....	1,000*	1,000*	1,000*	1,000*	1,000*
	.....	.....	1,250	1,250	1,250	1,250	1,250
	.....	.....	1,667	1,667	1,667	1,667	1,667
	.....	.....	2,000*	2,000*	2,000*	2,000*	2,000
	.....	.....	2,500	2,500	2,500	2,500	2,500
	.....	.....	.....	3,333*	3,333*	3,333*	3,333*
	.....	.....	.....	5,000*	5,000*	5,000*	5,000*

Note.—In selecting standard transformer voltage ratings for operating from standard circuits, refer to Table IV, Reference Number 9,215, "Electric Power Club Handbook."

Supreme Court, Wiping Out State Lines in Water-Power Claims, Sets Up Priority

A DECISION of paramount importance to the electrical industry has been rendered by the Supreme Court of the United States in the suit of the State of Wyoming against the State of Colorado, the Greeley-Poudre Irrigation District and the Laramie-Poudre Reservoir & Irrigation Company to prevent the diversion of the waters of the Laramie River. There is some question as to the exact purport of the decision due to the fact that Justice Van Devanter delivered the opinion without having reduced it all to writing. As a result the text of the opinion is not available as this is written. However, the finding allows Colorado to divert not more than 15,500 acre-feet of water, but preserves the prior rights of those who had diverted water for mining and other purposes. It is pointed out in the opinion that waters of the river have always been diverted for mining and other purposes and that these prior rights for mining and other beneficial uses of the water have been recognized by the courts and by Congress, having grown up as a matter of custom and right. These mining diversions have been in both states, and priority of appropriation gives superiority of right to the water.

The opinion has the effect of obliterating state boundaries in the matter of the use of water. States as such have no ground on which to base an appearance in court. This privilege is enjoyed, however, by any citizen of any state who considers himself aggrieved. Under the Supreme Court's verdict, it is a matter of first come first served. Any citizen, regardless of the state in which he resides, may put the water to use. Those putting the water to use first have a prior claim against any subsequent appropriator.

The decision is a complete reversal of the Colorado theory. The position of Colorado, deduced from the decision in the case of Kansas vs. Colorado, was that it was the keystone of the arch. Since most of the water in the Colorado River falls on watersheds within the State of Colorado, it had attempted to establish a prior claim on water originating in Colorado whether or not it was put to use in that state. The waters of the Colorado will be appropriated and put to use faster in the lower basin of the river than will be the case in the upper basin, and the decision means that Colorado must do nothing which interferes with those entitled to priority in the use of the river's water.

In view of the Supreme Court decision it is believed that great activity will arise along the entire Colorado River in the effort to establish prior use. One of the fortunate features of the situation is that there is a great abundance of water. While it is assumed that the state laws will govern in maintaining the right to use the water for irrigation before it is used for power purposes, the prior rights already established in the Imperial Valley and in other sections of the lower Colorado will require such a volume of water as to insure the development of large amounts of power in the canyon sections of the river. Secretary of Commerce Hoover said on June 13 that the decision had simplified greatly the task before the Colorado River Commission. The decision will add greatly to interest in the hearing to be conducted at Santa Fé on Aug. 1. At that hearing suggestions undoubtedly will be made for procedure in establishing prior rights.

A preliminary analysis of the opinion made by one of the departmental law officers, which he specifies is subject to correction, owing to the fact that he did not have a copy of the opinion, is as follows:

It is a recognition of the doctrine of prior appropriation regardless of state lines between the appropriators in two states on an interstate stream, whether the suit is between individuals in the two states or whether it is between the states themselves, provided both states recognize the doctrine of prior appropriation within their boundary.

The case is distinguished from that of Kansas vs. Colorado, which applied the doctrine of equitable apportionment as between states on the ground that the law in the two states differed, *i.e.*, Kansas recognized the common-law doctrine of riparian right and Colorado the doctrine of prior appropriation.

The contention of Colorado that she as a state rightfully may divert and use the water of an interstate stream, regardless of prejudice to others having right in the stream beyond her boundary, is held untenable on the ground that the stream is but a single stream in which each state has an interest that must be respected by the other.

The contention of Wyoming that a proposed diversion by Colorado was not permissible on the ground that it was a diversion to another watershed from which Wyoming can get no benefit is not sustained, as such a diversion does not necessarily form a ground for a complaint where the practice of diversion is recognized in both states.

A dictum is uttered to the effect that where water is put to a recognized beneficial use in both states the fact that in one state it can be more highly used is not controlling in the matter of the right of the two states to the water.

Another dictum is to the effect that the water originating in Colorado and flowing into Wyoming is not a contribution by Colorado to Wyoming as the river was there long before the states.

No Important Change in Coal Situation

THE proverbial calm which precedes a storm seems to have settled over the coal situation. No additional mines were closed last week and no mine in union territory was opened, so far as reports to the government show. Production is standing still and the same is true of prices. Secretary Hoover has replied vigorously to the critics who accuse him of being "buncoed" by the operators and is continuing his efforts to bring about the co-operation of retail coal dealers.

"The essential thing about the coal prices," the Secretary says, "is that the runaway market has been stopped, prices have receded from those reached on May 15 except for a small percentage of the total production where co-operation is refused, and the public has so far been protected from a repetiton of 1920."

Washington Water Power Company Buys Intermountain Power

THE Washington Water Power Company has recently completed the purchase of the Intermountain Power Company, which was organized about five years ago to construct and operate a transmission line to transmit power from the Long Lake station of the Washington Water Power Company and supply it to the Washington Division of the electrified Chicago, Milwaukee & St. Paul Railway. The transmission is about 100 miles at 110,000 volts. The ownership of this line will place the Washington Water Power Company in a strategic position in furnishing service to central and southeastern Washington. Extensions from the line are already planned as part of the policy of expansion now under way.

Carrier-Current Relay Perfected

OVER three miles of underground cable and one mile of aërial construction two street-lighting circuits at 4,400 volts were turned on and off by means of a relay and carrier currents in a recent test made at Lynn, Mass., by radio engineers of the General Electric Company before representatives of the Associated Edison Companies. In the station a high-frequency generator with a vacuum tube was used to change the 110-volt, 60-cycle energy to carrier-current frequency. The output of the high-frequency generator was then superimposed on the 4,400-volt, four-mile street-lighting feeder circuit supplying Little Nahant.

The demonstration was arranged to control either of two street-lighting circuits in Little Nahant. One circuit consisted of eighteen incandescent lamps and two arc lamps, and the other comprised two 1,000-watt searchlamps, two 500-watt floodlamps and a pendent lantern. Each circuit was controlled by a carrier-current relay, and the turning on or off of the lights was acomplished by control of the frequency of the carrier current supplied to the relays.

No Muscle Shoals Decision Yet in Sight at Washington

THREE reports on the Ford proposal to purchase the Muscle Shoals government plant were introduced into the House of Representatives on Friday of last week by members of the military affairs committee. A "majority" report presented by acting Chairman McKenzie of Illinois and signed only by himself called for the acceptance of Henry Ford's proposal as amended by the committee to eliminate the Gorgas steam-power plant. It declared the money consideration of $5,000,000 "not the vital one" and dwelt on the continued obligations over a hundred years as the real consideration. Supporters of the McKenzie bill believe that Mr. Ford would accept it, despite its elimination of the Gorgas plant from the proposed contract.

Representative Wright, Democrat, of Georgia asked the House to accept the Ford offer as it was finally submitted, without amendment or modification. His report, which was signed by two Republicans and six Democrats, laid emphasis on the nitrate-production feature of the Ford plan and denounced the Alabama Power Company's contract with the government as having "the elements of neither law nor morality and therefore no standing."

Representative Parker, Republican, of New Jersey believed the Ford tender should be altered materially if accepted at all, or that the Shoals properties should be returned to the jurisdiction of the War Department and Secretary Weeks authorized to dispose of them under terms approved by Congress. Mr. Frothingham, Republican, of Massachusetts was the only other signer of the Parker report. Ten committeemen failed to sign any one of the three reports.

Efforts are being made to bring about the consideration of the McKenzie report in the House by circulating a petition among the members asking that it be taken up. If these efforts succeed, the bill may be amended on the floor to include the Gorgas plant. A statement to the effect that the President is opposed to a vote on the bill at this time, which was published widely, was denied emphatically on the floor of the House by Majority Leader Mondell. A Republican conference on legislation is to determine whether to bring the Ford offer on the floor or to take up instead the Senate plan to appropriate $7,500,000 to complete the Wilson dam as a government activity. In the meanwhile another member of the military affairs committee, Representative Morrin of Pennsylvania, will, it is said, present to the House another set of minority views, severely criticising the Ford offer from every angle.

Illinois Commission Holds Hearings on Rural Service Rules

A CONSIDERABLE amount of confusion in the rural-lines rules situation in Illinois culminated last week in a formal hearing before the Illinois Commerce Commission at Springfield. About two years ago the commission promulgated General Order No. 59, in which several methods of establishing service were permitted. Service to the consumers as individuals under a plan by which the line was constructed at the expense of the farmers and turned over to the utility was one of the methods, and the others provided for wholesaling of energy to mutual companies or to regularly organized rural utilities. Recently the order was rescinded as the result of complaints from farmers' organizations, and the hearing on Wednesday and Thursday of last week was devoted to the taking of evidence to show that there are costs in serving rural customers in excess of the cost of serving similar customers in urban territory and that there are other factors involved which make it necessary to treat such consumers as a separate class in determining the fundamentals on which rates for service shall be established. The investigation is not complete, and it is probable that several additional hearings will be held.

Past and Present State Commissioners Oppose Bacharach Bill

HEARINGS on the Bacharach bill, which is designed to limit the jurisdiction of the United States district and circuit courts in the matter of granting injunctions suspending the enforcement of decisions by state and municipal public utilities commissions, were closed at Washington on June 9, when the opposition completed its testimony.

Former Public Service Commissioner Paul P. Haynes of Indiana, who represented the Interstate Public Service Company of that state, said that the real intent of those behind the bill was to strike down state regulation in the interest of municipal executives of the kind unfairly antagonistic to the utilities.

A statement from Carl D. Jackson, chairman of the Wisconsin Railroad Commission and president of the National Association of Railway and Utilities Commissioners, declaring that the state commissions should welcome judicial review and interpretation, was read, as was a letter from J. W. McCardle, chairman of the Public Service Commission of Indiana, declaring that legislation like the Bacharach bill "will lead to inevitable chaos."

It is understood in well-informed legislative circles in Washington that the sub-committee that has had charge of the bill will probably report that it would be unconstitutional. It is not probable that the bill will be made a part of the legislation to be considered at present.

Fuel Costs and Rural Service Brought Up at St. Paul Convention

ASSERTING that the increase in the cost of coal since April 1 has again caused the cost of operating electric utilities to rise, President T. D. Crocker of the North Central Electric Association, in his address at the annual convention of the association at St. Paul on Wednesday, recommended that the utility men compare their rates and the changes since 1914 with the commodity price curves issued by the United States Labor Bureau, using the maximum-rate step and plotting the increases on a percentage basis. While he recommended that utilities maintain a reserve of six to twelve weeks' coal supply, he warned against panic-stricken buying in fear of a shortage next fall and winter. He recommended the adoption of a constructive program to show the farmers the problem involved in rural service and said that with a full understanding the farmer will help in its solution.

L. D. Peavey of the Babson Statistical Organization said that the electric appliance industry afforded a wonderful opportunity if quality were constantly improved and prices kept down. W. H. Hodge of Chicago discussed the customer ownership movement.

R. F. Pack, vice-president of the National Electric Light Association, gave a review of its policies in promoting the development of the central-station industry.

The convention continued through Thursday and the annual banquet took place Thursday evening.

Money Cost Vital Factor in Water Power, Says President of C. E. A.

THE thirty-second annual convention of the Canadian Electrical Association, a geographic division of the National Electric Light Association, was held in Ottawa, Ontario, on Thursday, Friday and Saturday of this week. Although made up of privately owned electric light and power companies operating chiefly in Quebec and Ontario, the Canadian Electrical Association has in the past two years shown remarkable growth, and that notwithstanding that the electrical situation in Ontario is dominated almost entirely by the Hydro-Electric Power Commission. This is evidenced by the fact that in the last year its membership, including manufacturing as well as operating companies, was increased 56 per cent.

The presidential address of Julian C. Smith of the Shawinigan Water & Power Company af Montreal was devoted largely to water-power development in Canada. He said Dominion statistics indicate that the power capacity of water-power stations for all purposes is at present increasing at the rate of about 200,000 hp. yearly, of which approximately three-quarters is for central electric power stations. To care for this increase will require an expenditure of $30,000,000 yearly, one-half of which will be financed in Ontario by the government-owned utilities. The rest would have to be raised through the investment houses of Canada. Hydro-electric bonds and other forms of security, Mr. Smith said, are enjoying a well-deserved reputation in Canada. In 1912 the average cost of money to good hydro-electric enterprises was about 5 per cent. In 1921 this cost had increased to about 8 or 9 per cent, a prohibitive figure for expansion. This year shows improved conditions, good companies being able to obtain money for from about 6 to 6½ per cent, and the indications point to money within a year on a 5½ to 6 per cent basis. This, according to Mr. Smith, is a vital matter, since it means that the electrical industry in Canada can look forward to the development of water power on a large scale. The cost of power on the busbars of a water-power station is made up of about 85 per cent interest and 15 per cent operation charges, maintenance and taxes. Before the war taxes constituted about 1 per cent of the total cost of power, but they now amount to 7 or 8 per cent and in many cases equal or exceed the cost of operation and maintenance combined. This, Mr. Smith said, was of importance in deciding between government-owned and privately owned utilities.

The greater part of the program comprised reports of standing committees. A feature of the convention was a profusely illustrated lecture on illumination by W. D'A. Ryan Thursday night, which was open to all.

The National Electric Light Association was represented by W. H. Onken, Jr., editor of the ELECTRICAL WORLD, who delivered a message from President-elect Frank W. Smith, who was unable to be present.

John W. Lieb Warmly Greeted in Italy

RETURNING to New York on the Paris last Monday, John W. Lieb, vice-president of the New York Edison Company, brought to an end a two months' visit to Italy, the scene of some of his early labors. Mr. Lieb, who was accompanied by his wife, was warmly welcomed in Italy, especially by old friends and business associates in Milan, where he was the guest of honor at meetings and banquets organized by the local branches of the national engineering societies of the nation. While he was in Rome he was appointed United States delegate to the International Railways Congress and made an honorary member of the National Railway Society. In Turin he attended the ceremonies organized by the Associazione Elettrotecnica Italiana in commemoration of the twenty-fifth anniversary of the death of its first president, Galileo Ferraris, and, in the presence of government authorities and leading engineers, deposited on Ferraris' monument two bronze wreaths, one sent by the National Electric Light Association and one by the American Institute of Electrical Engineers, of both of which societies Mr. Lieb is a past-president. Mr. Lieb, who speaks Italian fluently, also delivered a lecture before the Italian Electrotechnical Association at its Turin hall.

A TRIBUTE FROM AMERICAN ENGINEERS TO FERRARIS

A. E. A. Holds Well-Attended Convention

A THOUSAND delegates, representing a membership of 22,000 in 192 chapters and sixty-one clubs scattered throughout the United States, assembled at Salt Lake City for the eighth annual convention of the American Association of Engineers last week.

Officers elected for the ensuing term are: President, A. N. Johnson, Maryland; first vice-president, G. E. Taylor, West Virginia; second vice-president, A. M. Knowles, New York. The secretary and the treasurer are appointed by the board of directors.

Daily Program Now Drawn Up for A. I. E. E. Niagara Falls Meeting

THE tentative program for the annual convention of the American Institute of Electrical Engineers, to be held at Niagara Falls, Ontario, on June 26-30, which was published in outline by the ELECTRICAL WORLD on May 13, has now been arranged by sessions as follows, Monday, June 26, having been set apart for conferences:

TUESDAY, JUNE 27

Morning.—"The Two-Stage Current Transformer," by H. B. Brooks, Bureau of Standards, and F. C. Holtz, Sangamo Electric Company; "Three Thousand Tests on the Dielectric Strength of Liquid Insulation," by J. L. R. Hayden and W. N. Eddy, both of General Electric Company; "Control of Gaseous Conduction," by V. Bush and C. G. Smith, both of American Radio & Research Corporation; "Determination of Temperature of Electrical Apparatus and Cables in Service," by E. J. Rutan, New York Edison Company. Parallel session: "The Economics of Direct-Current Railway Distribution, with Particular Reference to the Automatic Substation," by L. P. Crecelius and V. P. Phillips, Cleveland; "Light Without Glare," by Ward Harrison, National Lamp Works, Cleveland; "Philadelphia-Pittsburgh Section of the New York-Chicago Cable," by James J. Pilliod, American Telephone & Telegraph Company; "A Method of Determining Resultant Input from Individual Duty Cycles and of Determining Temperature Rating," by Bassett Jones, New York.

Afternoon.—"Queenston-Chippawa Development of the Hydro-Electric Power Commission of Ontario," by F. A. Gaby, chief engineer of the commission; description of the 45,000-kva. Queenston generators, by B. L. Barns and F. Bowness, both of the Canadian General Electric Company, and R. A. McCarty, Westinghouse Electric & Manufacturing Company, and H. U. Hart, Canadian Westinghouse Company; "Features of Main Power-House Transformers in Queenston Station," by C. A. Price, Canadian Westinghouse Company, and M. E. Skinner, Duquesne Light Company.

Evening.—President's address, reception and informal dance.

WEDNESDAY, JUNE 28

Morning.—"Questions Relating to Standards of Rating," by F. D. Newbury, Westinghouse Electric & Manufacturing Company; "Probable Values of Conventional Allowance for Alternating-Current Generator Stator Windings," by F. D. Newbury; "Temperature Limits in Large Machines," by Philip Torchio, New York Edison Company; "Higher Steam Pressures or Pulverized Coal?" by F. A. Scheffler, Fuller Engineering Company.

Afternoon.—Visit to Queenston plant.

Evening.—Lecture, "Niagara Falls Plants," by J. L. Harper, vice-president Niagara Falls Power Company.

THURSDAY, JUNE 29

Morning.—Summarized history of the rating of cables in relation to voltage, by the sub-committee on wires and cables of the standards committee; "Dielectric Losses and Stresses in Relation to Cable Failures," by D. W. Roper, Commonwealth Edison Company; "On the Minimum-stress Theory of Cable Breakdowns," by D. M. Simons, Standard Underground Cable Company; "Effect of the Composite Structure of Impregnated Paper Insulation on Its Electric Properties," by W. A. Del Mar and C. F. Hanson, both of the Habirshaw Electric Cable Company; "Potential Gradient in Cables," by W. I. Middleton and E. W. Davis, both of the Simplex Wire & Cable Company, and Prof. Chester L. Dawes of Harvard University; "Corona in Air Spaces in a Dielectric," by J. S. Shrader, Westinghouse Electric & Manufacturing Company; "Action and Effect of Moisture in a Dielectric Field," by Delafield Du Bois, Safety Insulated Wire & Cable Company; "Rating of Cables in Relation to Voltage—Bibliography on Dielectrics," by D. M. Simons.

Afternoon.—Board of directors' meeting, entertainment features and inspection trips.

Evening.—"Some Suggestions for Possible Improvements in Methods of Engineering Education," by B. G. Lamme, Westinghouse Electric & Manufacturing Company; "Education," by S. E. Doane, National Lamp Works, Cleveland; "Principles of Engineering Education," by Philip Torchio, New York Edison Company; "Better Preparation of Students for Railway Work," by I. C. Forshee, Pennsylvania Railroad Company; "Training for Character," by A. M. Dudley, Westinghouse Electric & Manufacturing Company; "Suggestions Concerning the College Education of an Engineer," by Carl Hering, Philadelphia.

FRIDAY, JUNE 30

Morning.—"Baltimore Oil-Circuit-Breaker Tests," by H. C. Louis, Consolidated Gas, Electric Light & Power Company, and A. F. Bang, Pennsylvania Water & Power Company; "Tests on General Electric Oil Circuit Breakers at Baltimore," by J. D. Hilliard, General Electric Company; "Tests on Westinghouse Oil Circuit Breakers at Baltimore," by J. B. MacNeill, Westinghouse Electric & Manufacturing Company; "Transmission-Line Relay Protection," by E. A. Hester, R. N. Conwell, O. C. Traver and L. N. Crichton of relay sub-committee of protective devices committee.

The usual entertainment features have been arranged for delegates and ladies accompanying them, including sightseeing trips, golf and tennis tournaments, baseball and a musical recital by Prof. Vladimir Karapetoff.

The cable research committee, a sub-committee of the transmission and distribution committee of the A. I. E. E., D. W. Roper chairman, will hold an open meeting on the subject of high-tension cable joints on Thursday afternoon, June 29. The evening of the same day is available for continuing the discussions. Since seven papers on cable insulation are to be presented on Thursday morning, this cable-joint discussion will not interfere with the regular technical session, but will supplement the morning session. Methods of testing experimental joints and determining the proper method of filling joints and the question of joint insulation are some of the features under discussion by the committee.

Chicago to Require Permits for Radio Installations

AN ORDINANCE requiring the issuance of permits before the installation of a radio set of any character and in general treating such installations in the same manner that electrical wiring installations are treated has been introduced into the City Council in Chicago. The application for a permit under the new ordinance would have to be accompanied by a drawing showing a plan view of the property, the details of installation of the antenna, and all buildings and wires adjacent to the latter. If the application and the proposed plans are in proper form, a permit authorizing the installation of the apparatus described will be issued. The ordinance provides for inspection during or after installation and for reinspection of such stations. For inspection a fee of $3 for receiving stations only and $5 for transmitting and receiving stations will be charged. Reinspections will be charged for at $1.50 per hour, with no charge less than $1.50. Installation requirements are made for receiving stations only and for combined transmitting and receiving stations. When it is necessary to do any wiring to take power from street mains the ordinance provides that the work can be done by licensed electricians only. Estimates of a yearly revenue of $100,000 have been placed on the license features of the proposed ordinance. Penalties of from $5 to $100 for each violation of it are provided, and each day's use is constituted a separate violation.

Wisconsin Municipal Plants Now Buy Their Energy.—Records of the Wisconsin Railroad Commission are to the effect that only thirty out of sixty-nine publicly owned electric plants now generate their energy, the other thirty-nine purchasing it from central-station or distributing companies.

Electrical Men of Salt Lake City Hold "Forty-niner" Party.—On May 27 an electrical "forty-niner" party was held under the auspices of the Rocky Mountain Electrical Co-operative League at Salt Lake City. Nearly 800 persons were present, representing all branches of the industry in Salt Lake and nearby towns. The "get-together" spirit of the league prevailed.

Hydro-Electric Development on Flambeau River, Wisconsin. — The L. E. Myers Company, Chicago, a concern which has passed its thirtieth annual milestone as builder and operator of public utilities, is developing a hydro-electric project at Big Falls on the Flambeau River, Wis., 10 miles northeast of Ladysmith. A construction gang is forming the foundation of the dam, which will cost $2,500,000 and is expected to be finished in 1923. The electrical equipment is to include two 3,300-kva. turbo-generators, and space will be allowed for the future installation of similar units.

Shanghai's Good Electrical Record.—The 1921 report of the electricity department of the Shanghai Municipal Council shows that this flourishing Chinese port continues the record of electrical progress it has shown in other years. Compared with the five largest municipally owned undertakings in Great Britain, Shanghai outranks all but Manchester in output and shows by far the best load factor. Here are the figures, all for 1921 except Liverpool, for which the 1920 figures were the latest available:

	Kw.-hr. Sold	Maximum Kw. Demand	Load Factor, per Cent
Manchester	199,618,813	89,500	25.46
Shanghai	185,364,746	41,074	51.50
Glasgow	154,175,830	76,964	22.87
Sheffield	141,361,701	66,463	24.28
Birmingham	136,921,417	67,100	23.29
Liverpool	86,333,510	38,317	25.65

Southern California Edison Tunnel Men Break World Record.—In its race to keep ahead of the demand for electric power the Southern California Edison Company has just broken a record in tunnel construction, according to a report from the Big Creek headquarters of the company, where 3,500 men are engaged in harnessing the waters of the San Joaquin. In thirty days a crew of miners drove a section of tunnel 21 ft. square a total distance of 476 ft. through solid granite. A standard of 12 ft. daily had been set by the company, but this was raised to 15 ft. by the men themselves. This was accomplished in a section of a tunnel whose length when complete will be 30,000 ft. and which will serve to carry nearly the entire flow of the San Joaquin River from its junction with Big Creek to the site of Power House No. 3, where it will be utilized.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Chicago to Issue Bonds for Street Lighting.—Approval of a new two-million-dollar bond issue for lighting was obtained at the Chicago judicial election on June 5. George E. Carlson, Commissioner of Gas and Electricity, said that this issue will permit an addition of 13,000 lamps to Chicago's lighting equipment. In addition to these new lamps Mr. Carlson proposes to move 3,000 gasoline lamps to outlying districts now without street lighting. The bond issue will provide standard illumination for 300 miles of streets.

Dallas Company to Erect Another Plant.—An authorized statement of the Dallas Power & Light Company announces that it is having plans prepared for the erection of another power plant to cost approximately $2,200,000. C. E. Calder, president of the company, says that the new plant will be immediately adjacent to the present power plant, but will be so arranged that in case of necessity it can be operated independently. The building, which will be 156 ft. x 112 ft., will house a 15,000-kw. turbine, which, with the auxiliary machines and electrical equipment, will cost approximately $700,000. Four boilers of 1,500-hp. rating each will be arranged to burn coal, oil or gas as may prove most economical. By the installation of control devices guesswork in the firing of these boilers has been reduced to a minimum. The cost of the boilers will be approximately $675,000.

New Utility Company Organized to Operate in Arkansas.—The Mississippi Valley Power Company is a new corporation organized to acquire and operate approximately 60 miles of 33,000-volt and 13,200-volt transmission lines in the State of Arkansas, together with distributing systems in eleven communities. Two other towns are connected to the transmission lines and will be served on a wholesale basis. In addition, the company will acquire pole lines serving a number of coal mines in intermediate fields. Energy will be purchased from the Fort Smith Light & Traction Company under a favorable twenty-five-year contract, and delivery of energy will be made at Alma, Ark., the eastern terminus of that company's 33,000-volt transmission line. The territory served consists of a group of prosperous agricultural communities in western Arkansas. The communities are developing rapidly, and the company, which is to be under Byllesby management, has as yet only in small part satisfied their demands for electric power.

Voluntary Daylight Saving Fails in Washington.—The voluntary daylight-saving system tried in the national capital, by which the government departments were opened and closed an hour in advance of the regular time, although the clocks remained the same, is to be abandoned. The system has been found impracticable owing to the failure of the people to readjust their night life. They stay up as late as ever, it is alleged, but have been required, much against their will, to get up an hour earlier.

Associations and Societies

Marconi to Address New York A. I. E. E.—On Tuesday, June 20, William Marconi will address a joint meeting of the New York Section, A. I. E. E., and the Institute of Radio Engineers on "Radio Telegraphy," and the latter society will present to Mr. Marconi its medal of honor for his pioneer work in the field of radio. The meeting will be held in the auditorium of the Engineering Societies Building.

New York Electrical Society.—At the annual meeting of this society last week the following officers were elected: President, J. M. Buchanan; vice-presidents, Erich Hausmann, J. P. Alexander and J. L. Pitcher; secretary, George H. Guy; treasurer, Thomas F. Honahan. The address of Dr. Frank B. Jewett on "Some of Our New Electrical Organs of Speech" was an able summing up of recent developments, especially in radio telephony. Dr. Michael I. Pupin, in his address on "What the Society Has Done and What Its Mission in the Future Should Be," praised the accomplishment of the society in setting a standard of meetings which emphasize the human side of science. He announced that one recognition of the society's work along this line had been given by the Hartley Corporation, which has set aside the sum of $10,000 as the Francis Bacon Crocker fund, the income of which will be devoted to the work of the society.

Coming Meetings of Electrical and Other Technical Societies

N. E. L. A. Geographic Divisions—Iowa Section, Lake Okoboji, June 20-22; New England, New London, Conn., Sept. 5-7; Great Lakes, French Lick Springs, Ind., Sept. 28-30.

Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25. (For program see issue of June 3, page 1139.)

Society for the Promotion of Engineering Education—Urbana, Ill., June 20-23.

American Society of Civil Engineers—Portsmouth, N. H., June 21-22.

American Association for the Advancement of Science—Salt Lake City, June 22-24.

American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 22-24.

A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30. (For program see "News of the Industry.")

American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.

National Council Lighting Fixture Manufacturers—Cleveland, June 28-29.

Ohio Electric Light Association—Cedar Point, Ohio, July 11-14. (For program see issue of May 13, page 972.)

A. I. E. E., Pacific Coast Convention—Vancouver, B. C.—Aug. 8-11.

International Association of Municipal Electricians — New Bedford, Mass. Aug. 22-25.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

"Going Value" Reflected in Purchase Price Cannot Be Allowed.—A claim for "going-concern value" made by the Republic Light, Heat & Power Company, which supplies natural gas in the Batavia district, was disallowed by the New York Public Service Commission where it appeared that this company had acquired the property by purchase from other companies so that going value, if it ever existed, must have been reflected in the purchase price paid on the various transfers of property.

Demand Rates Under Low Load Factor.—The improbability of a simultaneous demand on a power company's system in rendering service having a low load factor led the Utah Public Utilities Commission to say, in dealing with a complaint made by the Utah Manufacturers' Association against the Utah Power & Light Company: "An examination of the schedules and of their application as shown by the evidence has convinced us of the inapplicability of a uniform demand rate to all classes of consumers regardless of load factor. At the low load factors it is apparent that there is a greater probability of diversity and that the effect of simultaneous demand on the power company's system is much less than the aggregate demands. We believe from the evidence that at the very low load factors a considerably higher average diversity factor than two may be obtained. The effect of this is shown by the high kilowatt-hour charges paid by consumers at less than 6 per cent load factor."

Extensions to Real Estate Tracts.—Maintaining that a public utility should not be required to invest its money in the extension of mains and electric lines along streets of a real estate subdivision where there are no premises to be served, the New York Public Service Commission, adjudicating a case brought by a real estate development company against the Rochester Gas & Electric Corporation, said: "It is unquestionably the duty of a public service corporation to meet and anticipate the development of the territory in which it exercises its franchises. . . . However, if the respondent were required to make the extensions requested by the petition, it would receive no immediate income from the sale of its commodities as there are no customers, and a fair return upon the money expended in such work would have to be borne by its consumers. It would establish a precedent for extensions into territory where no present need of service exists and would involve the expenditure of capital by public utilities upon which, in all fairness, they should be entitled to a return which could only be obtained at the expense of present consumers in the rates charged for commodities."

Public Utility Advertising Indorsed.—Describing newspaper advertising as the most effective and cheapest form of salesmanship, President Brundige of the California Railroad Commission has indorsed the reasonable use of newspaper space by power companies to promote and extend their business. A statement to this effect was made by him in response to a question as to the right of power companies to charge advertising to operating accounts, especially in a territory where competition is not a serious factor. That utilities in certain fields do not have serious competition does not affect the proper use of advertising, the commissioner said, and he pointed out that modern advertising seeks to create new business rather than to take business away from a competitor. When advertising is reasonably and wisely used, measured by results obtained, and is not of the type carrying political propaganda, it is a legitimate operating expense. By creating an increased volume of business the advertising results ultimately in a reduced cost to consumers, thus being not only legitimate on the part of the company but desirable from the standpoint of the ratepayers.

Massachusetts Commission on Service Charge.—In permitting the Malden & Melrose Gas Light Company to make a base service charge of 35 cents (see issue of May 6, page 894), the Massachusetts Department of Public Utilities said: "It seems manifest that customers using little or no gas but desiring nevertheless to have their premises connected with the company's mains not only contribute little to the company's revenue, but not enough to cover the company's out-of-pocket expense incurred solely for them. It is to correct the inequality resulting from the present rates that the company is proposing a service charge. The question is, therefore, not primarily one between the company and its customers, but rather between the customers themselves as to the most equitable method for raising a given amount of revenue. With this as the real issue and recognizing the merit of dividing the rate into a definite service or customer charge and a selling price based upon the units of gas used rather than the uniform selling price now employed, we have been disposed to approve the adoption of such a scheme of charging within reasonable and proper limits whenever a company deems this step expedient. The question, therefore, to which we have chiefly directed our attention has been the amount of the service charge to be approved."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Service Deposit Must Be Asked from All Customers Alike.—It is discrimination to ask some customers to make a service deposit while others are supplied on furnishing a guarantee from some one known to the company. This is the finding of the Kentucky Court of Appeals in Barringer vs. Louisville Gas & Electric Company, where the plaintiff sued to recover his five-dollar deposit and received judgment in the lower court which is thus affirmed. It was alleged that 90 per cent of the customers had their bills guaranteed by a man employed by the company.

Claim that Power Company Furnishing Steam Is Not a Public Utility as Regards the Latter Service Untenable.—The Supreme Court of Pennsylvania, in Beetem vs. Carlisle Light, Heat & Power Company, a suit to recover charges paid for live steam, which were in excess of contract rates but authorized by the Public Service Commission, overruled the contention that in rendering this service the company was not acting as a public utility and was therefore not subject to commission jurisdiction and declared that the courts did not have jurisdiction. (116 At. 676.)*

Whether Excessive Charges Were Paid Under Duress a Question for Jury.—In an action brought by the Piedmont Power & Light Company to recover from the L. Banks Holt Manufacturing Company an amount charged in excess of the rate agreed on, where it was shown that defendant in 1919 tried to get power elsewhere and finally refused to pay the increased price, it was for the jury to determine whether payments made without protest from September, 1918, to June, 1920, at such increased rate were made to prevent the shutting down of defendant's plant, chaotic industrial conditions at that time making it impossible to obtain power elsewhere and rendering protest useless. So holding, the Supreme Court of North Carolina confirmed a judgment of nonsuit and awarded a retrial. It was not the duty of the manufacturing company, the court held, to apply to the state commission for relief against an increase of contract rates, the power company being bound by these rates unless relieved by the commission, and payments in excess of such rates made under apprehension of having to close down the plant are recoverable. (111 S. E. 623.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

David B. Rushmore, chief engineer of the power and mining department of the General Electric Company, has recently been appointed to the staff of consulting engineers of the company. Mr.

D. B. RUSHMORE

Rushmore's promotion is to enable him to devote his time more fully to the general engineering problems in which he is particularly interested. His most important work has been the upbuilding of the power and mining department, one of the General Electric Company's largest engineering divisions, the training and development of a staff of engineers and the broadening of the work of a division whose influence has been felt in every line of industrial power activity in the electrical industry. He became connected with this department in 1907 and for the larger part of the succeeding fifteen years was its directing head. Mr. Rushmore was born in Old Westbury, N. Y., in 1873. He took an engineering degree at Swarthmore College in 1895, the degree in civil engineering in 1897, and received a mechanical engineering degree from Cornell University in 1895. His early work was with the Pond Machine Tool Company, the Westinghouse Electric & Manufacturing Company and the Royal Electric Company of Montreal. In 1899 he joined the staff of the Stanley Electric Manufacturing Company of Pittsfield, Mass., and he entered the employ of the General Electric Company in 1905, when the Stanley interests became a part of the General Electric organization. Mr. Rushmore is a member of technical societies here and abroad.

Frank J. Sprague, pioneer in electrical operation of street railways and originator of multiple-unit train control, received the honorary degree of doctor of science from Columbia University at its graduation exercises on June 6.

Dexter S. Kimball, dean of Cornell University, who is the president of the Society of Mechanical Engineers and also the vice-president of the Engineering Council of the Federated American Engineering Societies, left on June 3 on a trip which will take him to the principal cities of the country in an effort to bring about a closer working arrangement between Western and Eastern engineers. The American Society of Mechanical Engineers is planning an elaborate nation-wide program of engineering activities and public service involving co-operation with the federal government. Dean Kimball's mission is largely to familiarize the engineers of the Far West with this program.

L. L. Ferree has been appointed general manager of the Georgia-Alabama Power Company and the Georgia-Alabama Utilities, Inc. Mr. Ferree comes to this new position after some twenty-odd years of construction, designing and executive experience in the electric light and power industry. He was born in Millersburg, Pa., March 10, 1878, and attended the Miffin Academy, where he was graduated in 1897, and later took special post-graduate courses in mathematics and engineering. Following graduation he entered the employment of the Tennis Construction Company, and afterward was with the Philadel-

L. L. FERREE

phia Rapid Transit Company. In 1902 he became associated with the Paxtang Electric Company of Harrisburg, Pa., during the construction of its powerhouse and distribution system. After the completion of this work he became superintendent of operations and finally general superintendent of this property. Upon the consolidation of the company with the Harrisburg Light, Heat & Power Company, he was made general superintendent of the consolidated companies. In 1919 he joined the organization of Day & Zimmermann, Inc., and assumed the management of their property at Salem, Ohio. On March 1 of this year he was transferred to Albany, Ga., in the capacity already stated.

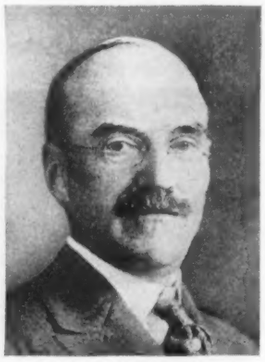
H. T. Sands was elected chairman of the Public Relations Section of

H. T. SANDS

the National Electric Light Association at its recent convention held in Atlantic City. Mr. Sands was born on Sept. 12, 1867, and attended and was graduated from the public schools of Saco, Me. He entered the electric light and power industry in 1896, when he became connected with the Mechanics Falls Water, Electric Light & Power Company as superintendent of construction of a dam and power house at Mechanics Falls, Me. He continued with this company for nearly six years, during that period acting as superintendent, wireman, meterman, bookkeeper, collector, station mechanician and station operator. In 1901 he became superintendent of the Lewiston & Auburn Electric Light Company of Auburn, Me., which position he held until 1905, when he became manager of the Haverhill Electric Company of Haverhill, Mass. Since that date Mr. Sands has been connected in various capacities with different companies known as the "Tenney companies." He is at present president of the Haverhill Electric Company and of the Montpelier & Barre Light and Power Company, Montpelier, Vt.; vice-president of the Malden Electric Company and the Malden & Melrose Gas Light Company, Malden, Mass.; the Suburban Gas & Electric Company, Revere, Mass.; the Exeter & Hampton Electric Company, Exeter, N. H., and the People's Gas & Electric Company, Oswego, N. Y.

Owen D. Young, chairman of the board of directors of the General Electric Company, was awarded the honorary degree of doctor of laws by Union College of Schenectady at the one hundred and twenty-sixth commencement of that institution.

F. S. Hunting, who has been general manager of the Fort Wayne division of the General Electric Company for a number of years, has resigned to become president and general manager of the Robbins & Myers Company,



F. S. HUNTING

Springfield, Ohio. Mr. Hunting has been with the General Electric Company for thirty-four years and has spent a large part of this time in charge of the production and sale of small electric motors, such as are produced by the Robbins & Myers Company.

R. L. Groome has been appointed sales manager of the Chicago Lighting Fixture Company, which firm is the Middle West branch of the Shapiro & Aronson Company of New York. Mr. Groome previous to being connected with the Chicago Lighting Fixture Company was with the Mitchell Vance Company of New York.

Giuseppe Faccioli has been elected a vice-chairman of the American Institute of Electrical Engineers, representing District No. 1, which includes the New England States. Mr. Faccioli comes to this executive position with the Institute after many years of experience as a designing electrical engineer. He was born in Rome, Italy, in 1877 and was graduated from the Polytechnic of Milan, Italy, as a mechanical and electrical engineer in 1899. He designed alternating-current machinery in Europe until 1902, when he came to the United States. After working at the laboratory of the New York Edison Company and for the Interborough Rapid Transit Company of New York City he entered the Crocker-Wheeler Company in 1904 as designing electrical engineer. At the end of the year he was assigned to the study of the new induction alternator and low-frequency exciter with which William Stanley was then experimenting. The following year he went to Great Barrington, Mass., as assistant to Mr. Stanley in the Stanley laboratories. In 1906 these laboratories became a part of the General Electric organization. Mr. Faccioli was transferred to the transformer engineering department of the General Electric Company at Pittsfield, Mass., in 1908, and in 1911 was appointed assistant chief engineer of this department. In 1914 he was appointed chief electrical engineer of the Pittsfield works, which position he holds at the present time. Mr. Faccioli is the author of about twenty papers, read before technical associations and prepared for publication in the technical press.

H. D. Burrell, treasurer of the International Radio Corporation, has been appointed managing director of that company.

M. H. Goldhammer of the Denver office of the General Electric Company, has recently been transferred to the New York offices of that company.

Harry Randall, district manager of the General Electric Company in Denver, is chairman of the committee in charge of displaying the Denver electrical home.

Dr. Richard C. Tolman, director of the fixed-nitrogen laboratory of the Department of Agriculture, Washington, D. C., has resigned to accept the chair of physical chemistry and mathematical physics at the California Institute of Technology at Pasadena.

Paul J. Kruesi of Chattanooga, Tenn., has been appointed Acting Assistant Secretary of Commerce during the absence of C. H. Huston abroad. Mr. Kruesi was born in Menlo Park, N. J., in 1878 and received his first business experience with the General Electric Company at Schenectady, N. Y., and the statistical department of the Chicago Edison Company. He is now president and owner of the American Lava Company, the Chattanooga Electro Metals Company, electric furnace maker of pig iron, and the Southern Ferro-Alloys Company, producer of steel alloys. He has other business interests of varied character.

T. J. Pace has been appointed manager of the supply sales department of the Westinghouse Electric & Manufacturing Company. Mr. Pace has been

T. J. PACE

with the Westinghouse company since 1899. In that year he entered the sales department, remaining there until 1902. At that time he was appointed manager of the illuminating and rectifier section of the supply department. In 1915 he was made assistant to the manager of the supply department and in 1920 was appointed assistant manager of that department.

Obituary

Col. H. D. Loveland, in length of service the "dean" of public utilities commissioners in the United States, died at his home in San Francisco on June 11. Colonel Loveland had been a member of the California Railroad Commission continuously since 1907. He was born in New York in 1853 and was one of the best-informed men in the country on transportation problems.

Charles E. Arnold, for many years connected with railroad building and telegraph companies, died this week at his home in Mount Vernon, N. Y. Mr. Arnold was born in Adams, Mass., in 1852 and when but a young man was made general Eastern passenger agent of the West Shore Railroad. He established the Commercial Union Telegraph Company and organized the Saratoga Electric Railway Company. He built numerous other railroads. Eighteen years ago he moved to Mount Vernon and was made manager of the Western Union Telegraph Company in that city, holding that position until two years ago, when he retired.

Herbert M. Tucker, general manager of the Grafton County Electric Light & Power Company, died on May 29, of apoplexy. Mr. Tucker was a self-made man in every sense. He was born in Northfield, Vt., fifty-five years ago and after a small amount of education he spent several years on a ranch in Montana. Upon returning to Lebanon, N. H., he entered the employ of the Lebanon Electric Light Company and worked his way from the bottom up until he finally became general manager of that company some years ago. This company, together with the Mascoma Electric Light & Power Company, was merged about seven years ago into what is now known as the Grafton County Electric Light & Power Company, and on the retirement of its manager Mr. Tucker succeeded to the post.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Volume of Business Jumps 32 per Cent Over Week Before

VOLUME of business for the week ended June 7, as measured by debits to individual accounts reported to the Federal Reserve Board for banks in 165 clearing-house centers, totaled $9,638,000,000, or about 32 per cent in excess of the total of $7,315,000,000 for the preceding week. End-of-month settlements, payments for the $200,000,000 of Treasury certificates of the June 1 series, the larger number of business days in the week (six instead of five in the closing week of May) and a heavier volume of stock exchange transactions largely account for the increase shown.

Trade Continues to Improve

DESPITE continued strikes in some industries and new elements of uncertainty in the labor situation, business recovery is being extended, in the opinion of Dun's and Bradstreet's weekly reviews of industry, throughout the country. Retail trade is better, it is stated, and retailers show more disposition to buy for the future. The industries, especially iron and steel and automobile lines, are more active, and crop reports have improved.

Demand for Fans Increases Materially Throughout the Country

DEMAND for fans has materially increased during the last week, reports made to the ELECTRICAL WORLD show. In Atlanta cool and continued rainy weather has materially interfered, however. While jobbers have closed very satisfactory contracts with their retailers and have shipped many fans under these contracts, retailers' failure to make sales has served to cause an accumulation of stocks.

New England jobbers are looking for an excellent fan season. Stocks in general are as large as last year, and some jobbers report 10 to 15 per cent more on hand. Although there was a considerable carry-over, the expectation of better demand led to broader purchasing by distributors. Last week buying by the public got a fine start owing to severe heat extending through several days. The price reductions undoubtedly stimulated sales to retailers, and the effect carried through to the public.

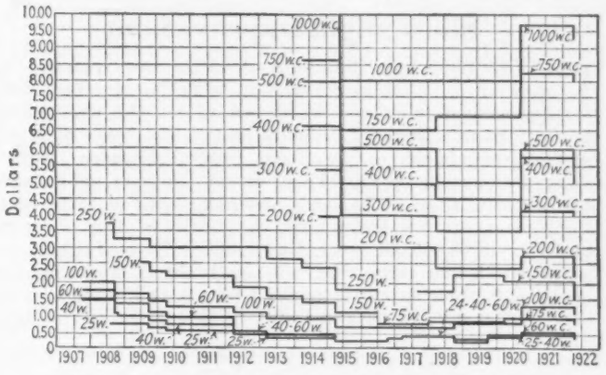
St. Louis reports that absence of warm weather for any continuous period has resulted in very poor fan sales to date. Sales in May were but 50 per cent of the amount anticipated. Unless a real fan business develops by July 4, the entire season's business will be exceedingly dull. At the beginning of the year all stocks were very low as the result of a small carry-over from last year. Jobbers purchased in fairly good amounts, but what were then considered conservative. The dealers have been extremely conservative in their purchases, and as a result stocks in the hands of the jobbers are mounting to the point of heaviness.

Very warm weather in Portland, Ore., is helping to sell large numbers of fans. Last season was a poor fan season there, and there were large hold-over stocks. A shortage of fans is predicted if the season proves to be very warm.

The fan outlook for 1922 in the Middle West is much better than last year's. Nearly all jobbers state that their stocks are in good shape and that there was very little stock carry-over from 1921. No trouble to dispose of fans has been evidenced. The humid weather of the past weeks has started the season's buying, and while it is too early to estimate the relative percentages, dealers report that the volume of buying is better than that of a year ago. Prices on an average are about 12 to 15 per cent lower than those quoted in 1921. While the public is interested in the cheaper grades, there is, however, a majority who are looking for well-built fans serviceable for several seasons.

Canadian Lamp Committee Finds 40-Watt Size Most Widely Used

THAT the 40-watt vacuum lamp is apparently the most popular size used in Canada, and that the 25-watt and 60-watt sizes closely follow in sales, is the feature of a report just issued by the lamp committee of the Canadian Electrical Association. In the report the lamp committee



CHANGES IN PRICES AND TYPES OF LAMPS IN CANADA

has confined itself largely to presenting information that will be of educational and technical value to the member companies and to the lamp-buying public in general.

Of the many million of lamps consumed annually, the following analysis indicates the relative proportion of the various wattages and types:

TYPE B	Per Cent	TYPE C	Per Cent
Sign lamps	3.1	50-watt	2.9
15-watt	4.6	75-watt	4.0
25-watt	20.8	100-150-watt	5.7
40-watt	22.5	200-250-watt	2.1
50-watt	10.2	300-1,000-watt	0.7
60-watt	17.2	Street series	0.2
100-watt	1.6	Others	0.4
Street railway	1.9		
Others	2.1	Total	16.0
Total	84.0		

The accompanying chart shows the dates of introduction of the various types of lamps, also the history of price changes between 1907 and June, 1922.

Cost of Living Decreases

IN THE estimate of the Bureau of Labor Statistics that the total average decrease in the cost of living in the United States from June, 1920, to March, 1922, was 22.9 per cent, a table is published classifying the changes by

specified cities. Decrease in living costs during that period was largest in Savannah, Ga., where it declined 25.1 per cent. It was smallest in Los Angeles, Cal., where the decrease was 14.5 per cent. The decrease in other important cities varied as follows: At New York, 22.5; Boston, 23.5; Cincinnati, 24; Kansas City, 23.6; New Orleans, 15.5; Pittsburgh, 21.3; St. Louis, 23, and Denver, 21.2.

Freight Car Shortage Anticipated in Railroad Circles

ALTHOUGH officials of the American Railway Association recently declared it was impossible to estimate the railroad traffic situation six months hence with any degree of accuracy, nevertheless it is known that a shortage of cars by fall is anticipated. There is at the present time a surplus of approximately 70,000 box cars, but this number will be rapidly pressed into service on the termination of the coal strike, which, it is forecast, will end before Aug. 1.

Loading of revenue freight during the week which ended May 27 totaled 821,121 cars, compared with 792,459 cars during the previous week, or an increase of 28,662 cars, according to reports from the American Railway Association. This was also an increase of 25,786 cars over the corresponding week last year, but a decrease of 77,048 cars compared with the corresponding week in 1920.

Credit Conditions in Southern Districts Show Slight Improvement

COLLECTIONS in Southern districts are reported as showing a slight improvement, with the prospect that further improvement will be shown within the next thirty to sixty days. Demand deposits in the last week of April in forty-two banks in the Sixth Federal Reserve District show an increase of $8,000,000, or 3.4 per cent, while saving accounts show an increase of eight-tenths of 1 per cent. Bank clearings for Atlanta for the month of May show an increase of $8,000,000 over May, 1921. These factors, together with the sales that will be realized from bumper peach and apple crops in north Georgia this season, indicate that many old accounts will be liquidated in the near future.

Industrial Building Shows Marked Increase

ONE of the best indications of rapidly reviving industrial activity is seen in the volume of new industrial construction planned, as reported by the Industrial Commissioner of New York. Plans for construction work in that state outside of New York City for the first quarter of this year are in the expenditures proposed nearly double those for the corresponding period last year. This year's plans call for expenditures aggregating $4,022,618 as against $2,191,446 in 1921, an increase of $1,831,172, or over 83 per cent. Over $3,736,000 of the whole amount is for new buildings, the balance covering repairs and alterations to existing buildings.

Another record-breaking month of construction is reported by the F. W. Dodge Company. All previous records were broken in April, May building contracts passing the April total with a margin of 3 per cent. The May total for the twenty-seven Northeastern States was $362,590,000, which was 50 per cent greater than for the corresponding week of last year.

These two record months have brought the volume of construction started from Jan. 1 to June 1 up to $1,352,965,000, the highest recorded figure for the first five months of any year. The year to date is 61 per cent ahead of last year.

From the accompanying figures, it will be seen that there was not only an increase in the money involved but also in the number of plans submitted, this year's plans for the quarter totaling 115 as against ninety-four for the same period last year. The increase also held good on the question of new building, the 1922 figures showing thirty-two new buildings as against twenty-eight for last year. The new building last year involved $1,979,500, while the new building this year aggregated $3,736,500.

COMPARISON OF INDUSTRIAL BUILDING IN NEW YORK

	Number Of Plans	Cost	New Building
First quarter of 1921	94	$2,191,446	$1,979,500
First quarter of 1922	115	4,022,618	3,736,500
Increase	21	$1,831,172	$1,757,000

In commenting on this increase, Commissioner Henry D. Sayer says: "We consider these figures of great value as indicating a decided improvement in manufacturing conditions. We believe they show a marked increase in confidence on the part of manufacturers, who, it would seem, would not be prepared to invest so largely in new buildings if they did not believe there would be a speedy improvement in conditions. No man will tie up his money in new factories that are to remain idle. In other words, these new factories are going to be built, and when they are built will be put in operation. This will mean not only the betterment of conditions through the building of the factories themselves, but will also mean large increases in the number of factory workers employed.

"It should be kept in mind, also, that the figures above do not include Greater New York, and it is without doubt true that they do not represent all of the proposed factory building outside of New York City, as the law does not make it mandatory that builders submit their plans to the department. Because of this it is probable that there are other factory buildings that are going up the plans for which have not been submitted to our engineering division."

Westinghouse Electric Starts 32 Cars of Apparatus to Chile

AS THE first shipment in filling the seven-million dollar contract for electrification of the Chilean State Railways awarded the Westinghouse Electric & Manufacturing Company last October, a train of thirty-two cars of electrical apparatus has been started from East Pittsburgh. This is the largest single consignment of apparatus for railroad electrification that has ever been made, it is stated.

Metal Market Situation

DOMESTIC demand for copper is considered only fair, while foreign demand has shown renewed activity during the last few weeks. Japan has bought a total of several million pounds during the last two days.

Sales of domestic are mostly for July, with some inquiry still for June and a fair demand noted for August. The prices, which have been advancing steadily for more than four weeks, definitely reached the apex at 14 cents a few days ago.

NEW YORK METAL MARKET PRICES

Copper:	June 7, 1922	June 14, 1922
London, standard spot	£ s. d. 63 2 6	£ s. d. 63 2 6
	Cents per Pound	Cents per Pound
Prime Lake	14.00	14.00
Electrolytic	13.87½	13.75
Casting	13.37½	13.37½
Lead, Am. S. & R. price	5.65	5.75
Antimony	5.25	5.12
Nickel, ingot	36.00	36.00
Zinc, spot	5.70	5.75
Tin, straits	32.62½	31.25
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	11.50 -11.75	11.00 -11.50
Brass, heavy	5.50 - 6.00	5.50 - 6.00
Brass, light	5.00 - 5.25	5.00 - 5.25
Lead, heavy	4.70 - 4.75	4.70 - 4.75
Zinc, old scrap	2.87½- 3.00	3.00 - 3.12½

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

BUSINESS in the electrical trade continues at about the same levels as last week without any particular outstanding features. The demand for wiring materials is being well maintained, and as there appears to be no let-up in building activity, the market for supplies promises to be fairly strong through the summer and well into the fall.

Jobbers' stocks generally are in good condition, and shipments on all items are coming through promptly from the manufacturers. Prices are holding to their former levels, although price cutting is not so much in evidence.

Central-station business took on greater activity during the past week and dominates the jobbing field. Demand is for generating equipment, transformers, meters, pole-line materials, in fact, virtually everything a power company can use in the manufacture and sale of its product.

Demand for radio materials is very sluggish. It is now felt throughout the trade that if stocks had been ready for the heavy requirements of the enthusiasts two months ago, approximately 50 per cent more business would have been done in this field. Static conditions are blamed for the diminution in interest, but hope is felt that sales during fall and winter will greatly exceed average expectations.

A slight price increase in the rubber-covered wire market is reported, but the majority of jobbers have not raised prices. The market for this material seems to be unsettled and prices appear spotted. Stocks are good in all cities reporting. The call for bare and weatherproof, while steady, has not increased materially.

NEW YORK

Warmer weather during the past week has brought a heavy demand for fans, and jobbers have been extremely busy filling orders. If sales continue to show the same rate of increase for the remainder of the season as has been made thus far, it is expected that this year's fan business will exceed that of last year by at least 30 per cent. Coincident with the summer weather the radio business has fallen off sharply, and some jobbers state that it is "flat" at the present time and that they expect it to remain so for the next two or three months.

Rigid Conduit.—Demand is moderate, and sales are mostly in small lots. Jobbers are more inclined to hold for the higher schedule of prices, although there are a few houses that still have small quantities of pipe bought before the advance. Prices continue to show the following range: For ½-in. black pipe in 2,500-ft. lots, $44.50 to $46.58; ¾-in., $58.10 to $59.57, and 1-in., $82.79 to $84.66 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities were $50 to $51.68, $64.50 to $66.47 and $92.20 to $94.88 per 1,000 ft.

Rubber-Covered Wire.—Prices are steady and demand is only moderate. No. 14, rubber-covered, single-braid, is quoted at $6 to $6.50 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—This material is moving steadily, and prices are firm. No. 14, two-wire, single-strip, is quoted at $43 per 1,000 ft. and double-strip at $45 to $47 per 1,000 ft., both for that quantity or more.

Loom.—Non-metallic flexible conductor is in comparatively small demand here, and sales are usually in small lots. The 5/32-in. and ¼-in. sizes, listing at 5.5 cents and 6 cents per foot, are quoted at 70 per cent discount in coil lots. In quantities of 1,000 ft. or more an additional 10 per cent is quoted.

Metal Molding.—Prices are a little lower on this material. The three-wire size in 100-ft. to 500-ft. lots sells for $5 per 100 ft., and in quantities from 500 ft. up to 1,000 ft. it sells for $4.50 per 100 ft.

Outlet Boxes.—In standard-package lots black boxes are quoted at 60 to 62 per cent off list, and galvanized boxes at 55 to 57 per cent off list in the same quantity. Stocks are good and demand is fair.

Tape.—Friction and rubber tape are both quoted at 36 cents per pound in lots of 25 lb. or over.

Fans.—Jobbers report an exceptionally active demand for fans, and so far sales this year show an increase of about 30 per cent over those of last year.

Radio.—It is generally agreed that the demand for radio equipment will be fairly light until fall, when atmospheric conditions will be more favorable and people more inclined to remain indoors in the evening. This lull is expected to be more beneficial than otherwise as it will give the manufacturers, jobbers and dealers a breathing spell and an opportunity to put this business on a more stable basis.

CHICAGO

A few price increases were noticed in this week's electrical market. These changes were on wiring materials—rubber-covered wire and conduit. However, jobbers are holding to their old prices since their stocks obtained before the latest advance are good. The demand for both of these commodities is still active as the building industry is requiring more material every day. The call for lighting fixtures is also riding on the surface of this building activity and dealers are reporting a goodly volume of sales.

An indication of an improved money market is shown by the announcement that call money is now available at 3 per cent. This is the first time since April 17, 1918, that this figure has been so low. Manufacturers are reporting that the efficiency of labor is growing. One tire maker with 2,700 men is doing the same amount of work accomplished by 5,500 men when labor was expensive and its production was at its lowest mark.

Wire.—Although the demand for rubber-covered wire is still good, prices remain spotted. One jobber reports a slight price increase due to the stiffened copper market, but the majority of jobbers have not raised the price. Most of them prefer to allow their customers the benefit of stocks obtained when the rates were lower. The No. 14 rubber-covered is quoted around $6.10 per 1,000 ft. in 5,000-ft. lots. Stocks are good. The call for the bare and weatherproof, while steady, has not increased.

Conduit.—An advance of about 2 per cent was reported on pipe this week, but in general prices have not been advanced, since competition is still keen. The ½-in. black pipe sells around $43 per 1,000 ft. in 5,000-ft. lots, the ¾-in. for $56 and the 1-in. for $84. The galvanized pipe in the same sizes is listed at $49, $64 and $92. The movement has been active and steady with a good volume of small-sized orders. Stocks are ample.

Flexible Armored Conductor.—Most jobbers say that this conductor has slowed up slightly, but market conditions have not changed. The stocks are in ample condition and the No. 14 two-wire, single-strip, retails for $42.50 per 1,000 ft. in 5,000-ft. lots.

High-Tension Equipment.—Business in this line is continuing its healthy growth of the past month. One manufacturer recently shipped an order for fifty 37,000-volt lightning arresters to a utility in Philadelphia. Three 600-kva., 33,000-volt outdoor steel-tower substations were shipped to the Southwest by another company. Manufacturers also report an active demand for 33,000-volt pole-top switches and for farm-lighting equipment.

Lighting Fixtures.—Along with the steady increase in the building of residences and apartment houses there has come an active demand for lighting fixtures. Dealers report that the public are more interested in better designs

selling at a fair price than in the cheaper grades. The call for industrial lighting fixtures has also been increased

Washers and Cleaners.—The call for this equipment has been steady, but creative sales effect is still necessary to increase the turnover. Where time payments run from eighteen months to two years dealers report that the interest shown is very active.

Tape.—Although sales are fairly uniform in volume, no changes have occurred. In 25-lb. lots prices range from 36 cents to 45 cents, depending upon the quality.

BOSTON

Increasing activity in electrical circles continues to reflect better business in this district. Jobbers are moving larger quantities of material, though orders are not of spectacular size. Deliveries are excellent in nearly all lines. Prices have stiffened slightly on non-metallic flexible conduit and weatherproof wire, owing to increased costs. Building and engineering contracts in New England for the week ended June 6 totaled $6,666,500, compared with $3,781,700 for the same period last year. Only once in twenty years has this particular week's total been equaled. Downtown Boston is undergoing the most sweeping demolition of old office buildings and construction of new buildings recorded for many years. Residential construction in suburban sections is extremely active. Employees are returning gradually to the textile mills in New Hampshire after prolonged strikes, and conditions in the Lynn shoe factories are improving. Retail trade is very good in New England. Central-station outputs are holding up well compared with last year. Financial conditions are easier and line extensions are going forward on a somewhat larger scale than for several years.

Loom.—On maximum quantities prices stiffened last week 50 cents per 1,000 ft. Stocks are ample and demand is moderate. On 5,000-ft. lots and over, 3/2-in. loom moves at $14.75 per 1,000 ft., the ¼-in. size bringing $17.

Wire.—Rubber-covered No. 14 wire is steady at $6.25 per 1,000 ft. in 1,000-ft. lots. Weatherproof base has advanced to 17 cents, and increased demand due to central-station activities is evident. Bare copper wire is selling in small quantities around 15½ cents to 16 cents base. Building construction is absorbing considerable rubber-covered wire at present.

Washers.—In response to vigorous sales efforts more washers are being moved. Variations in price are still a handicap to broad activity, it is felt in some quarters. The competition of both old and new manufacturers is sharp. Retail sales of washers are spotty, but results are following intelligent and persistent activity.

"Nail-it" Knobs.—In barrel lots these are moving at $15.50 per 1,000. Most of the demand comes from residential or small-store wiring jobs.

Lamps.—Business is better than a year ago, notwithstanding somewhat reduced buying by textile mills. Factory stocks are being increased in anticipation of a very heavy fall business. Prices are firm and the outlook is good.

Ranges.—Sales in the Boston district continue good and the outlook is excellent for the season. Deferred payments are helping to place this class of equipment in service.

Refrigerating Equipments.—Retail interest in this class of apparatus is increasing steadily. Sales during the last two or three months have been very encouraging. Deliveries are first-class and prices are firm.

Flatirons.—A brisk trade in flatirons is apparent, notwithstanding the long-time staple character of these devices. Manufacturers are in close competition.

ATLANTA

Agricultural conditions throughout the section are still very much retarded, with a consequent depression imminent unless weather conditions show immediate improvement. Cotton in Atlanta has reached a new high level for the year of $21.50, and this price is bringing a great deal out of storage. Sale of cotton holdings is assisting materially in stimulating business activities—most of the banks, even in the small towns, reporting an increase in deposits—and merchants seem to be more successful in collections and sales than for some time past. The automobile industry reports sales as the best in many months. Prospects in south Georgia are reported unusually good, with building on the increase and business in general quite optimistic, owing to the prospects of the large peach crop. Building in Atlanta is holding up splendidly, the permits for the month of May numbering 608, with a valuation of $1,743,054.

Schedule Material.—Home construction and small commercial building is causing a very satisfactory movement throughout the entire line, with stocks of material holding up remarkably well. No price changes have been reported recently.

Portable Drills.—This item continues slow, but the prospects are for a pick-up in the next sixty days, due as a result of the activities in the automobile trade. Stocks have been allowed to reach a low ebb, but shipments are satisfactory.

Industrial Motors.—A fair number of orders and a quite satisfactory amount of inquiries are being received in this line, there being a noted tendency toward the larger sizes of the synchronous type. Standard lines are on hand in fair quantities, while shipments on the synchronous type are quite satisfactory. Prices are holding firm.

Oil Switches.—This specialty seems to keep in close touch with the movement of motors, being stimulated somewhat by rulings in some of the cities requiring oil switches to be installed ahead of the compensator on motors of 550 volts and over. Local stocks are in fair to good condition with prices steady.

Panelboards.—Building construction is causing a very satisfactory volume of sales in this line, especially for the moderate-sized installations. Jobbers report shipments as satisfactory and prices steady.

Battery-Charging Outfits.—Sales of the small outfits are reported as quite satisfactory, most of them going in connection with radio equipment. The larger sizes are very slow as the automobile trade's activity has not been of long duration to make purchases felt.

Electric Ranges.—The demand for ranges can be classed as only fair, though in isolated localities sales are reported as comparatively good. The continued high prices tend to hold down the volume of sales in this specialty. Local stocks are in good shape, with shipments satisfactory.

Insulators.—Sales of the glass telephone type are reported very good, with the porcelain type on the increase. Central-station companies are taking increasing quantities. Good stocks and shipments are reported in both types.

ST. LOUIS

Central-station business is a predominating factor in the electrical jobbing field this week. Lower money rates are making possible much-needed enlargements of the power companies' facilities which were out of the question with the high rates of a year or more ago. The demand is for generating equipment, transformers, meters, pole-line materials—in fact, virtually everything that a power company can use in the manufacture and sale of its product. The municipal plants are likewise good buyers, most of the bond issues having been voted upon favorably.

The demand from the industrial companies, while improving, does not yet show the activity of the other sources of demand. Several new industrial projects are under construction, among them being a very large refrigeration plant. Merchandising materials on the whole are moving slowly. The fan season has not opened, and there is a noticeable backwardness toward buying on the part of the public. A contradictory feature in appliance sales is a good demand for heating pads.

Non-employment has diminished materially since the first of the year. All lines of industry are taking on additional men, especially the electrical manufacturers, automobile manufacturers, cement plants and steel mills. The Wagner Electric Company plant has added over 600 employees to

its force since the first of March and now has 2,000 workers on its payroll. The normal force is from 3,000 to 3,500.

Collections show very little change. The old long-due obligations are being liquidated slowly, but current obligations are being met comparatively well. The average is generally reported around sixty days. The agricultural improvement in the South has aided credit conditions very appreciably, and betterment in collections is anticipated after this season's crops are sold.

Bells and Buzzers.—The increased building activity has given impetus to sales, and fairly satisfactory business is now reported. A normal stock is generally found. In standard package quantities bells are quoted about as follows: Class C, 2½-in., 41 cents each; class C, 3-in., 44 cents each; class C, 4-in., 50 cents each; class B, 2½-in., 48 cents each; class B, 3-in., 51 cents each. Similarly, class C buzzers sell for 40 cents each and class B buzzers for 46 cents each.

Soldering Materials.—With conservative stocks and steady demand, prices are firm. Representative prices are as follows: Soldering paste, 2-ounce cans, 19 cents each; soldering sticks, 14 cents each; soldering salts, ½-lb. cans, 36 cents each; wire solder, 40-60, 22 cents per pound; bar solder, 40-60, 23 cents per pound; bar solder, 50-50, 28 cents per pound—all prices being for orders of twenty-five units of each class.

Bell-Ringing Transformers.—The demand is improving, though still slow, as the public is backward in adopting this accessory. In lots of ten a small size sells for 80 cents each, and a larger size for 85 cents each. A heavy-duty type, rated at 60 watts, brings $3.70 each.

Heating Pads.—An interesting development in recent sales is a strengthening demand for heating pads, hospitals being good purchasers. Some hospitals report the patients so well pleased with them that they have difficulty in maintaining their supply. One jobber reports he is now selling as many in a month as he formerly sold in a year.

Flatirons.—While the demand is comparatively good, it does not reach the volume anticipated. Special campaign work is under way in the hope of increasing sales. Stocks are slightly inclined toward heaviness.

Radio Supplies.—A diminishing in demand is perceptible, possibly of seasonable nature, but back orders are still heavy and any shipment of tubes is immediately taken. Some representative prices are as follows: "B" batteries, 16½-volt to 22½-volt, $1.80 each; 22½-volt, $1.05 each; head sets in orders of ten, $11.25 each; antenna strain insulators, $8.92 per 100; radio insulators, $7 per 100. Magnet wire in ½-lb. spools, double-cotton-covered, is quoted as follows: No. 20, 52 cents each; No. 22, 61 cents each; No. 24, 78 cents each; No. 25, 86 cents each; No. 26, 95 cents each; No. 27, $1.05 each; No. 28, $1.12 each; No. 30, $1.67 each.

SAN FRANCISCO

As an indication of the growth of building construction this spring, the value of San Francisco building permits for May was $4,377,066, compared with $1,097,151 for last year. Furthermore, the number of building permits for May of this year shows a 50 per cent increase over the number of permits for the preceding month, compared with a 25 per cent increase in the value of the permits, proving that residence building is increasing out of all proportion. The sudden rise of rivers in the interior valleys caused by rapidly melting snow on the Sierras has done a certain amount of damage. A very serious loss was caused to the orange crop by January frosts.

Retail business for the past few months has shown a decrease over previous months, but indications point to an increase. Furthermore, retail business this month will be stimulated by the fact that the Rotary convention in Los Angeles and other conventions in San Francisco will bring close to a half a million visitors to the state during June. The number of business failures is decreasing, collections are slightly better, employment is increasing, and many of the department stores have again taken on part of the employees that were released a few months ago.

Schedule Material.—Ocean shipments at low rates have resulted in excellent local stocks of all schedule material, and the proposed rail freight rate deductions will be a tremendous help, it is said.

Porcelain Material.—Porcelain lines are showing excellent movement, although because of building regulations this is more specialized. No. 5½ split knobs are now generally quoted at about $10.75 per 1,000, and two-wire and three-wire glazed cleats for No. 14 and No. 12 wire at about $19.25 per 1,000 pairs in barrels.

Radio Material.—Shipments are still very slow, and the result has been that many inquiries which would have led to immediate orders had stocks been forthcoming have now ceased to be urgent. There is now comparatively little activity in these lines, and the number of visitors to radio stores has markedly decreased. This may foretell a decline in the radio boom, but, on the other hand, most dealers feel that demand will even surpass its former proportions when stocks at last arrive.

SALT LAKE CITY

At the well-attended convention of the Northwest Electric Light and Power Association just held at Boise, Idaho, the vast development possibilities of the West were pointed out. A hopeful and optimistic spirit characterized every meeting of the convention. Announcement is made that several new concerns for the financing of home building have entered the field in the Intermountain country and they are said to have the co-operation of large firms in the East. Home building is still proceeding at a good rate. "Electrical home" demonstrations are putting over their message in the larger cities with good effect. Contractor-dealers report a growing interest in electrical appliances.

Crop conditions in this region are reported highly favorable. The season when late frosts threaten is well past, and the outlook for heavy fruit yields is very encouraging. Farm labor is plentiful, and agriculturists of all classes are in decidedly better shape financially. Highway construction, which is proceeding at a good rate in the Mountain States, is reflected favorably in general business conditions. Hundreds of men are finding employment, and the general buying tendency is showing improvement.

PORTLAND—SEATTLE

Most lines show a remarkable gain during the first five months of this year as compared with the first five months of last year. Building permits have increased 45 per cent, lumber shipments 206 per cent, and imports of silk entering the port of Seattle 80 per cent. The number of men employed on the docks to handle cargoes is now greater than at any time since the 1919 peak.

Lumber production for the week ended June 3 was 4 per cent above normal, while new business for the first time in many weeks fell below production. Building continues very active and prices of some building materials are stiffening materially.

Electrical jobbers report business improving with orders increasing. Manufacturers report that stocks are not so good, as inroads are made by increasing orders. Dealers' store sales are about normal with fixture business very active and on the increase.

Wire.—Rubber-covered wire is moving particularly well. Prices have been stiffening in recent weeks, and an advance of 2 to 3 per cent has just been made effective. Weatherproof wire is also moving better, and a similar increase applies to this item. Present quotations are: No. 14, rubber-covered, $6.70; No. 12, rubber-covered, $9.10; weatherproof wire, No. 8 to No. 4/0 inclusive, is quoted at 20 cents per pound in 500-lb. lots.

Lamp Cord.—This item is in fair demand at from $12.97 to $13.30 per 1,000 in 5,000-ft. coil lots.

Sockets.—The movement in sockets is very good. Approximate prices now in effect are: pull chain, $25; key $24.75, and keyless, $22.50 per 100, in standard-package quantities.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Multi Electrical Increases Capacity 50 per Cent

The Multi Electrical Manufacturing Company is now at 1848 West Fourteenth Street, Chicago, having moved from 703 Fulton Street. William T. Casey, the vice-president, speaking with a representative of the ELECTRICAL WORLD, said that this change increased the company's floor space about 50 per cent over the 1921 capacity, but rated on a 1920 basis it was an increase of 141 per cent.

More machinery and equipment are being added to allow better manufacturing facilities and maintenance of stocks. Mr. Casey said that the demand for porcelain bushings and fittings had been so active that he had experienced difficulty in maintaining his stocks. C. T. McDonald is president of the company.

X-Ray Reflector Company Increases Staff

The engineering staff of the National X-Ray Reflector Company, 235 West Jackson Boulevard, recently acquired the services of three resident engineers located, respectively, in Philadelphia, Cleveland and St. Louis. George P. Prichett's headquarters will be in Philadelphia, while Robert P. Burrows will be at the Cleveland office. John S. Gulledge, the resident engineer of St. Louis, will assist the Southern district manager, H. O. Bourkard.

American Wiremold Company Moves Offices

Executive and sales offices of the American Wiremold Company, Hartford, Conn., have been moved from the factory to 252 Asylum Avenue.

Indiana Electric Company Interested in Texas

Alexander G. Moore, industrial engineer of the Interstate Electric Company of Indiana, has been assigned by that company to make a survey of Marshall, Tex., and the surrounding territory. Mr. Moore will spend three weeks in making the survey, which will include the raw materials for manufacturing purposes, such as glass, sand, iron ore, lignite, pulp timber and fire clay, together with oil gas and other fuel possibilities. The results of the survey will be made available to new industries seeking locations in this section.

The survey was decided on as a result of the visit to Marshall of Martin J. Insull, president of the Interstate Electric Company. Mr. Insull is said to have been much impressed with the possibilities of Marshall as a center for various manufacturing industries.

Large English Concern to Invade Canadian Market

That British interests are to compete keenly in the Canadian electrical supply and engineering field is an avowed fact, according to P. Pybus, managing director of the English Electric Company, which last year formed a Canadian subsidiary, with a plant at Toronto. The lowered preferential tariff will prove a boon to the English company in its invasion of the Canadian market. According to Mr. Pybus, as much business as possible will be handled through the Toronto plant, although much will be contracted for in the home mills. It is said that the company intends to compete for every electrical contract in Canada.

Coast Equipment Company Made Representative of Meter-Tester Makers

The Coast Equipment Company of San Francisco, Seattle, Los Angeles and Portland, has been appointed representative of the States Company, Hartford, Conn., manufacturers of meter testing and related apparatus. To W. D. Hodgson, formerly representing the States Company and the Sangamo Electric Company in the Southeast, has been assigned the representation of the former in eastern New York State under the title of the Hodgson Electric Appliance Company. At present Mr. Hodgson can be reached at the States Company's headquarters, 72 Francis avenue, Hartford.

Another representative, recently appointed, is the Electric Appliance Company, 701 West Jackson Boulevard, Chicago.

Discussing business conditions briefly last week, C. P. Upson, sales manager of the States Company, said inquiries are very active for the central-station test tables produced by this organization and the sales of radio transformers are holdng up well. The volume of business in general compares favorably with that of earlier spring. A new section (No. 10) is out in the company's catalog No. 1 on "Phasing Transformers," and a new section (No. 2) has been published for use in the company's catalog No. 1 on "Potential Phase Shifters."

Declares Government Would Save $100,000,000 Placing Orders with Navy Yards

In testimony before the House Naval Committee, O. S. Boyer, consulting engineer for the International Association of Machinists, stated that the government would save $100,000,000 annually if it placed orders for equipment, repair work and supplies with navy yards and arsenals instead of with private firms under contract. The suggestion would cover electrical equipment, engines and other machinery.

Organize Hundred-Thousand-Dollar Corporation to Manufacture Radio Sets

The Anderson-Durand Radio Corporation has been organized and incorporated at Rochester, N. Y., for manufacturing radio receiving sets and novelties. Incorporators: Mortimer H. Anderson, Samuel E. Durand and John F. Durand. Capital stock is $100,000.

Traffic Signal Device Invented by General Electric Official

A device intended to supplant the semaphores now in use in New Orleans in controlling street traffic, an invention of Benjamin Willard, local manager of the General Electric Company, is being given a try-out by Commissioner Ray of the Department of Public Safety. This new traffic guard consists of a combination of three lights, each of a different shape—a round red light, a rectangular white light and a diamond-shaped green light. The signal is so constructed as to be visible from all directions and is to be suspended above the street.

New Agent-Jobber for Westinghouse

The Carolina States Electric Company, Charlotte, N. C., has been designated by the Westinghouse Electric & Manufacturing Company as agent-jobber for the company in North and South Carolina, according to an agreement reached May 22.

Heretofore the business of this company handled in the two states was credited to the agent-jobber in Richmond, Va., whle the nearest agent-jobber to the south was in Atlanta, Ga. The establishing of the agency at Charlotte will result, it is estimated, in the handling of $200,000 worth of business more through that city. The local company has under a special arrangement been operating as representative in this section for the Westinghouse concern for the past two years, but this is the first actual distribution company that has been established with headquarters in Charlotte.

The company handles all of the products of the Westinghouse company and has connections with other organizations that supply material needed for distribution but not manufactured by

Westinghouse. Offices and warehouse are located at 218 West First Street.

The officers of the Carolina States Electric Company have been formerly connected with the Westinghouse organization and formed and incorporated their company in December, 1919. These officers are: E. B. Graham, president; H. T. Long, vice-president in charge of purchasing; J. P. McMillan, vice-president in charge of sales; W. A. Emerson, secretary-treasury, and J. A. Auten, assistant secretary-treasurer.

Combustion Company Buys the General Combustion Rights

The receiver of the General Combustion Company, Chicago, has sold the name of that company, its patent rights, drawings, patterns, trade marks, good will and contract records, to the Combustion Company, 4256 North Western Avenue, Chicago. The combustion Company will continue the manufacture of the industrial furnaces and parts formerly manufactured by the General Combustion Company, the line including fuel-oil burners. Many inquiries and bookings have accumulated during the receivership, according to William T. Dean, president of the Combustion Company, and the management will give its attention to clearing up these matters.

Screw-Thread Matters to Be Considered

Screw-thread matters will be considered at three meetings which are being planned for the end of this month at Washington. One of the meetings will be that of the National Screw Thread Commission. The sectional committee on general engineering work plans to meet immediately after the meeting of the commission. The sectional committee on standardization and unification of screw threads also expects to meet at about the same time.

Condit to Sell Temperature-Indicating Apparatus

Exclusive sales rights in the temperature-indicating semaphore apparatus developed by the Standard Thermometer Company, Roxbury, Mass., have been acquired by the Condit Electrical Manufacturing Company, South Boston, Mass. All marketing of this equipment, which is of recent application to the transformer rating problem under varied service conditions, will be handled by the Condit organization.

New Instrument Company Established at Stamford

Radio apparatus and other engineering devices are to be manufactured at Stamford, Conn., soon by the Connecticut Instrument Company, a recently incorporated organization which has leased the Lounsbury & Soule factory on Broad Street. R. E. Gilmore, former general manager of the Sperry Gyroscope Company, Brooklyn, N. Y., is president and treasurer.

British Showing Considerable Interest in Radio

That considerable interest has been shown by the British public in the spread of wireless telephony and telegraphy in the United States is the feature of a report made this week to the electric supplies division of the Department of Commerce. It is said in the report that a campaign has been started for the development of similar facilities in Great Britain and that in this connection there may possibly be a market for inexpensive American wireless outfits.

Tuska Company Moves

The C. D. Tuska Company, manufacturer of radio apparatus at Hartford, Conn., has moved from 16 Hoadley Place to larger quarters at 69 Bartholomew Avenue.

The H. E. Gleason Company, lighting fixture manufacturer, Seattle, has moved from 1517 Second Avenue to 418 Union Street, where new and larger quarters will enable the company to care better for its rapidly increasing business.

The Electrical Products Manufacturing Company, manufacturer of electrical supplies, with a plant in Providence, R. I., has recently leased large floor space at 24 Fountain Street, that city, to be used for additions to its plant.

The Wyckoff Engineering Corporation has moved its headquarters from 233 Broadway, New York, to 56 West Forty-fifth Street in order to obtain room for necessary expansion of activities.

The Wagner Electric Manufacturing Company, St. Louis, has moved its Salt Lake City office to 313 Dooly Building.

The Simplex Wire & Cable Company, manufacturer of insulated wire and cable, Boston, has awarded to Stone & Webster, Inc., Boston, a contract for the construction of a four-story 100 ft. x 90 ft. reinforced-concrete fireproof addition to its plant at Cambridge, Mass. The new building will cost about $75,000.

The municipal electric plant at Fort Atkinson, Wis., has placed an order with the General Electric Company for three 333-kva. substation transformers and other apparatus, it is announced.

The Stahl Rectifier Company, formerly at 1401 West Jackson Boulevard, is now situated at 1455 Congress Street, Chicago. William Stahl, the president, states that the new location affords better manufacturing facilities with better lighting and air conditions.

Sale of Surplus Signal Corps Supplies—The War Department reports that up to May 15 a total of $520,981 of surplus supplies of the Signal Corps have been sold or transferred to other government departments. This amount is 65 per cent of the original cost of the materials.

The Radioceive Manufacturing Company, Newark, N. J., has been recently organized to manufacture radio devices and equipment. The following men are connected with the company: Emil F. Johnson, formerly of Emil F. Johnson & Company, New York City, treasurer; E. H. Lindholm, factory manager, and Ernest Mentor, sales manager.

Charles A. Burroughs & Staff, Newark, N. J., have leased a portion of the building at 17-23 Nevada Street for the establishment of electrical experimental laboratories, with manufacturing facilities, primarily for use in connection with wireless equipment. Mr. Burroughs is the inventor of the Everett head receiver, now being manufactured by the Splitdorf Manufacturing Company.

The Crescent Insulated Wire & Cable Company, North Olden Avenue, Trenton, N. J., will build a one-story addition to its plant. The company has recently organized a subsidiary, to be known as the Crescent Armored Wire Company. General C. Edward Murray heads both companies.

The Hygrade Lamp Company, Salem, Mass., has awarded all sub-contracts for the erection of its new four-story plant, 50 ft. x 100 ft., for the manufacture of electric lamps and kindred specialties, and plans to occupy the structure immediately upon completion.

M. M. Fleron & Son, Inc., Trenton, N. J., organized with a capital of $100,000, will specialize in the manufacture of radio equipment. All production for the present will be handled in outside local plants, including the Pyrolectric Instrument Company, Ingersoll-Trenton Watch Company and the Star Porcelain Company. The company is headed by Russell and Louis H. Fleron, 113 North Broad Street.

The Radio Corporation of America announces the opening of a district office of its sales department at 10 South La Salle Street, as well as a warehouse at "Unit B," Central Manufacturing Building, Chicago. This new office is to provide a more central point for distributors and thus offer them convenient facilities for the handling of radio apparatus.

The Federal Telegraph Company, Hobart Building, San Francisco, with the Radio Corporation of America, New York, is perfecting plans for the installation of a series of wireless stations in China, with the largest plant at Shanghai. The total cost is estimated at $13,000,000.

The Grand Central Mine, one of the largest in the Tintic district in Utah, has recently replaced its steam compressor with an electrically driven one, giving a materially increased supply of air at a greatly decreased cost of operation. Plans have been completed for the electrification of the hoist, and the necessary motors have been ordered. A new electric shaft signal system and mine telephone system will be installed within the next thirty days, it is reported.

Foreign Trade Notes

THE SOCIETA ITALO-AMERICANA PER LA ELETTROTRAZIONE has been formed in Italy, the *Electrician* states, for the purpose of constituting an association of Italian power companies and American firms in order to promote the production and distribution of electricity and the construction and operation of electric railways and tramways. The principal object of the company is the adoption in Italy of American systems of continuous-current high-tension transmission for traction systems, and some Italian engineers have been sent to the United States to study electrification methods.

PROPOSED COMMISSION TO PROMOTE NEW ELECTRIC PLANTS IN SOUTH AFRICA.—A bill for the appointment of a commission for establishing and maintaining stations for supplying electricity to government and local authorities, companies and individuals, also for an investigation regarding additional supplies and the co-ordination of existing undertakings with a view of stimulating the supply of electricity, has, according to the *Electrician*, been introduced by Mr. Malan, South African Minister of Mines and Industry, into the South African Parliament.

PAN-PACIFIC COMMERCIAL CONFERENCE.—The first Pan-Pacific commercial conference will be held in Honolulu, Hawaii, from Oct. 25 to Nov. 8, 1922, under the auspices of the Pan-Pacific Union. This is the fourth in the series of conferences which the Pan-Pacific Union is calling. The first was a conference of scientists from about the Pacific, the second one of educators, and the third one of journalists. Frank F. Bunker, Honululu, is executive secretary.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Quotations are desired by a firm in Canada (No. 2,376) for the purchase or agency for radio-telephone outfits, with amplifiers for private homes.

The purchase of any salable electrical novelties is desired by a firm in England (No. 2,436).

A dealer in electrical supplies in Italy (No. 2,438) wishes to purchase electric fixtures from firms in the United States.

Firm in Spain (No. 2,439) desires to purchase electrical machinery and supplies.

A merchant in Canada (No. 2,441) desires to purchase electric waxing brushes.

A firm in the Netherlands (No. 2,443) wishes to purchase or secure an agency for electric motors, pneumatic tools, all kinds of oil motors, steam turbines, etc.

A mercantile firm in Spain (No. 2,450) desires to purchase electrical supplies, etc.

New Apparatus and Publications

FUSES.—The Multiple Electric Products Company, Ltd., 450 Fourth Avenue, New York City, is distributing a four-page leaflet announcing the change in name of its "Atlas" heavy-duty railroad fuses to the "Multiple" time-lag fuses.

SUPERHEATERS.—Bulletin T-1 issued by the Superheater Company, 17 East Forty-second Street, New York City, describes and illustrates its "Elesco" superheaters.

PORTABLE ELECTRIC TOOLS.—The Cincinnati Electrical Tool Company, 1501 Freeman Avenue, Cincinnati, is distributing a six-page folder covering its electric tools.

STORAGE-BATTERY CHARGER.—The Wald Electric Manufacturing Company, 248-256 North Tenth Street, Brooklyn, N. Y., is distributing a leaflet describing its new "Niagra" storage battery charger (direct and alternating current) for radio, automobile or motorboat batteries.

CELL FILLER.—The Electric Storage Battery Company, Philadelphia, has recently developed the "Exide" cell filler, a new device for filling storage-battery cells.

LIGHTNING ARRESTER.—A new type of direct-current electrolytic lightning arrester, known as "Type AR," for car or station use on railway, power and lighting circuits, has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

SOOT CLEANER OPERATOR.—A new device, known as the "Vulcan ratchet operating head" for operating mechanical soot cleaners, has been brought out by the Vulcan Soot Cleaner Company, Dubois, Pa.

LIGHTING FIXTURES.—"P & S Standard Elexits Sales Information" is the title of an eight-page bulletin distributed by Pass & Seymour, Inc., Solvay Station, Syracuse, covering the "P & S" standard elexits. The company is also distributing a four-page leaflet describing its "B-R Fluto Base" and adjustable adapters for same.

HEATING UNITS.—The Edwin L. Wiegand Company, 422 First Avenue, Pittsburgh, Pa., has issued a six-page pamphlet announcing that it has added to its line of "Chromalox" products a complete line of electric range lids and hot-plate units ranging in sizes from 4½ in. in diameter, 440 watts, to 8¼ in. in diameter with the maximum input of over 2,000 watts designed for three heats.

ELECTRIC VACUUM CLEANER.—The Eureka Vacuum Cleaner Company, Detroit, has placed on the market a new vacuum cleaner, known as the improved model 9 "Eureka."

INSULATING AND SOLDERING COMPOUNDS.—A catalog supplement, known as 5-A, supplement No. 2, describing the Westinghouse line of insulating and soldering compounds and announcing the extension of that line of products, has been issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

OVERHEAD CRANE.—A new type of overhead crane, designed for power-plant service, has been brought out by Maris Brothers, Fifty-sixth Street and Gray's Avenue, Philadelphia.

TOOLS FOR HIGH-VOLTAGE WORK.—The W. T. Safety Tool Company, Inc., has issued a catalog covering its tools and equipment for working on high-tension transmission lines without interruption of service, including the sleever and twister set.

GENERATOR TEST STAND.—David W. Onan, 43 Royalston Avenue, Minneapolis, is distributing a leaflet describing the "Onan" generator test stand, lathe and bench and also the "Onan" generator test stand for Ford stations.

BOILER DAMPER CONTROL.—The Northwestern Manufacturing Company, Milwaukee, is distributing a booklet describing its new boiler damper control "Northwestern," for use with underfeed stokers using forced draft or with gas-fired or oil-fired boilers, recently developed by the company. The Southern States Equipment Company, 1921 Powell Avenue, Birmingham, Ala., is exclusive sales agent.

MOTORS.—The Reynolds Electric Company, 2,560 West Congress Street, Chicago, has issued bulletin No. 204, describing its type B alternating-current, split-phase induction motors, ranging from speeds of 840 to 3,450.

ELECTRICAL SUPPLIES.—The Benjamin Electric Manufacturing Company, 847 West Jackson Boulevard, Chicago, has issued a new pocket edition of catalog No. 23, covering the entire line of Benjamin products.

POLE-TOP SWITCH.—Bulletin No. 108 issued by Scweitzer & Conrad, Inc., 4435 Ravenswood Avenue, Chicago, describes its new three-pole, double-throw type R pole-top switch.

New Companies

THE TENNESSEE ELECTRIC POWER COMPANY, Baltimore, has been incorporated with a capital stock of $40,000,000 by Edward Winslow, George Lee Estebrook and George Rickard Nichols, all of Philadelphia.

THE WEST PENN-WEST VIRGINIA WATER POWER COMPANY, Kingwood, W. V., has been incorporated with a capital stock of $1,000,000 by A. M. Lynn, R. B. Keating and C. P. Billings, all of Pittsburgh.

THE WOMELSDORF (PA.) ELECTRIC COMPANY has been incorporated to furnish electricity in the borough of Womelsdorf. The incorporators are John S. Graybill, Jr., R. S. Hull and J. Guy Eshelman, of Lancaster.

THE MILLINOCKET & EAST MILLINOCKET LIGHT COMPANY Lewiston, Me., has been incorporated with a capital stock of $150,000 to construct and operate electric and gas plants in the towns of Millinocket and East Millinocket. The directors are: William B. Skelton, Lewiston, president; Charles B. Carter, clerk and treasurer, E. M. Dunn, and C. A. Litchfield, Auburn.

Record of Electrical Patents

Notes on United States Patents

(Issued May 23, 1922)

1,416,929. ART OF ELECTROLYSIS; William E. Bailey, Washington, D. C. App. filed Nov. 7, 1921. Apparatus for spot plating.

1,416,948. COMBINATION SOCKET AND RESISTANCE; Alfred H. Donahoe, Chicago, Ill. App. filed March 7, 1921. Switchboard panel lights.

1,416,963-1,416,965. ELECTRICAL HEATER; H. H. Moreton, Venice, Cal. App. filed July 30, 1920. Three patents on heaters with parabolic reflectors adaptable to lamps socket.

1,416,992. ELECTRIC TOASTER; P. K. Stehman, Elizabethtown, Pa. App. filed Feb. 3, 1921. Toasts on both sides simultaneously.

1,417,007. PROCESS OF MAKING ELECTRIC STORAGE BATTERIES; Horace M. Williams, Providence, R. I. App. filed Aug. 19, 1920. Solid electrolyte.

1,417,046. APPARATUS FOR PRODUCING OZONE; Harry E. Ellis, Jacksonville, Fla. App. filed Dec. 10, 1920.

1,417,073. ELECTRIC HEATER; H. Kruesheld, New Washington, Ohio. App. filed Feb. 1, 1921. Means for holding element.

1,417,074. ELECTRICALLY HEATED COOKING UTENSIL; H. Kruesheld, New Washington, Ohio. App. filed June 29, 1921. Coffee percolator.

1,417,079. ELECTRIC HEATING DEVICE; William F. Lebzelter, Elizabethtown, Pa. App. filed Feb. 3, 1921. Toaster.

1,417,095. FURNACE; R. P. Moodie, Ottawa, Ontario, Can. App. filed Nov. 26, 1920. Electric furnace for house heating.

1,417,109. PHONOGRAPH DRIVE MECHANISM; H. K. Sandell, Chicago, Ill. App. filed April 11, 1921. By electric motor.

1,417,114. ELECTROMETER; F. R. Sommer, Brooklyn, N. Y. App. filed June 15, 1920. Design of pole plates.

1,417,143. ELECTRIC REGULATION; J. L. Creveling, White Plains, N. Y. App. filed Nov. 10, 1916. For variable-speed battery-charging generator.

1,417,151. COMPRESSIBLE PILE REGULATOR; A. W. Donop, San Francisco, Cal. App. filed March 26, 1919. Carbon pile regulated by solenoid.

1,417,154. ELECTRIC HEATING APPARATUS; Thomas D. Finizio, Kitchawan, N. Y. App. filed July 15, 1920. Grill plate.

1,417,189. CONCENTRATOR; J. B. McCarthy, Copper Cliff, Ont., Can. App. filed Jan. 12, 1920. Separates metals from non-metals.

1,417,214. STORAGE-BATTERY ELEMENT; J. C. Sundby, Enderlin, N. D. App. filed Sept. 7, 1920. Construction of plates for a Planté battery.

1,417,287. COPPER CONDUCTOR FOR ELECTRIC LAMP BULBS AND OTHER VACUUM TUBES; Teizo Yanai, Tokyo, Japan. App. filed May 29, 1918. Copper lead in wire.

1,417,303. ELECTRIC FURNACE; Hector de Nolly, Lyons, France. App. filed April 8, 1920. For fusion and refining of metals.

1,417,315. ELECTRIC WATER HEATER; W. W. Graff, Cleveland, Ohio. App. filed July 6, 1921. Current turned on by flow of water.

1,417,342. ELECTRIC SHIP PROPULSION; J. Martin and F. H. Clough, Rugby, England. App. filed March 24, 1921. By synchronous motors with variable-frequency source.

1,417,350. TROLLEY WHEEL; Ellyson S. Robinson and J. Bowers, Richmond, Va. App. filed Jan. 3, 1922. Two-wheel trolley for trackless cars.

1,417,408. WIRE CONNECTOR; George W. Pugh, Leona Mines, Va. App. filed Oct. 24, 1921. For trolley wires.

1,417,409. ELECTRICAL WATER HEATER; T. L. Ralph, Bridgeport, Conn. App. filed Jan. 20, 1921. Operated by flow of water.

1,417,413. COLORATION OF METALLIC SURFACES; Tito Rondelli, Turin, Italy. App. filed June 30, 1920. For bronzing metallic surfaces.

1,417,421. ELECTRICALLY HEATED FLATIRON; Emil Stranszky, Dover, Ohio. App. filed March 5, 1921.

1,417,422. CIGAR LIGHTER; F. W. Strubing, Hartford, Wis. App. filed Sept. 27, 1920. Connected to 110-volt supply.

1,417,427. ELECTRIC HEATER; L. J. Tracy (deceased), St. Louis, Mo. App. filed March 11, 1921. Ornamental room heater.

1,417,430. LOCK; D. M. Tulloch, Dunellen, N. J. App. filed Nov. 9, 1920. Magnetic door lock.

1,417,452. ATTACHMENT PLUG; H. Catlin, Bridgeport, Conn. App. filed April 30, 1919. For electric irons, toasters, etc.

1,417,464. PRODUCTION OF THIN METAL SHEETS OF FOILS; T. A. Edison, West Orange, N. J. App. filed July 16, 1920. By electrodeposition.

1,417,479. TELEPHONE RECEIVER: Sigmund Honig, New York, N. Y. App. filed July 19, 1920. Loud-talking receiver.

(Issued May 30, 1922)

1,417,502. ELECTRIC TROLLEY CAR; Charles H. Copley, Springfield, Mo. App. filed May 28, 1920. Each controller connected to pole on opposite end of car.

1,417,585. APPARATUS FOR USE IN CONNECTION WITH CHEMICAL AND PHYSICAL OPERATIONS; A. T. Stuart and G. N. Middleton, Toronto, Ont., Can. App. filed July 5, 1917. Reaction temperature created by electricity.

1,417,608. HANDLE FOR ELECTRIC LANTERNS; J. W. Knoblock, New York, N. Y. App. filed Oct. 28, 1920. In form of hook.

1,417,620. ELECTRIC CLOCK; Paul Mansel, Charlottenburg, Germany. App. filed Aug. 15, 1918. Secondary clock with striking train.

1,417,649. PLUG-IN ATTACHMENT; D. P. and J. F. Williams, Sandusky, Ohio. App. filed May 21, 1921. For radio circuits.

1,417,662. RADIO-SIGNALING SYSTEM; Lee De Forest, New York, N. Y. App. filed June 16, 1917. One tube receiving circuit.

1,417,668. SHAPING AND IRONING TOOL; F. E. Kern, St. Louis, Mo. App. filed Feb. 14, 1921. For millinery work.

1,417,671. ELECTRICAL MEASURING INSTRUMENT; Paul M. Lincoln, Pittsburgh, Pa. App. filed Sept. 16, 1918. Calibrating device for thermal demand meter.

1,417,692. DRY BATTERY; D. Rosen, New York, N. Y. App. filed Nov. 13, 1920. Materials kept apart until time for use.

1,417,696. CAR-LIGHTING SYSTEM; G. F. Smith, Wilkinsbrug, Pa. App. filed June 9, 1919. Motor-generator trolley car set.

1,417,710. SYSTEM OF ELECTRICAL DISTRIBUTION; E. C. Ballman, St. Louis, Mo. App. filed Dec. 18, 1919. Control of lights connected to magneto.

1,417,715. RECORDING LOCK; J. W. Bryce, Binghamton, N. Y. App. filed June 26, 1920. For protection of stores, offices, etc.

1,417,731. MEANS FOR AND METHOD OF ACCELERATING INDUCTION MOTORS; R. E. Helmund, Swissvale, Pa. App. filed Aug. 10, 1918. Operated from variable primary frequency.

1,417,732. MEANS FOR AND METHOD OF ACCELERATING INDUCTION MOTORS; R. E. Hellmund, Swissvale, Pa. App. filed frequency changers and phase converters.

1,417,733. SYSTEM OF CONTROL; R. E. Hellmund, Swissvale, Pa. App. filed May 7, 1919. Accelerating and regenerative operation of railway motors.

1,417,734. SYSTEM OF CONTROL; R. D. Hellmund, Pittsburgh, Pa. App. filed July 5, 1919. Regenerative control for railway motors.

1,417,735. SYSTEM OF SPEED CONTROL FOR INDUCTION MOTORS; R. D. Hellmund and H. G. Jungk, Swissvale, Pa. App. filed Aug. 26, 1918. Accelerating induction motor associated with frequency changer.

1,417,750. MOTOR-CONTROL SYSTEM; Edwin S. Lammers, Jr., Elmira, O. App. filed May 28, 1919. Regulating speed of controller after abnormal condition.

1,417,786. SOUND-RECEIVING APPARATUS; William L. Walker, New York, N. Y. App. filed Nov. 19, 1917 Detects sounds in water.

1,417,787. RAILWAY LIGHTING SYSTEM; L. A. Watson, Port Washington, N. Y. App. filed Jan. 29, 1916. Axle driven generator with a storage battery.

1,417,803. MAGNETOMETER FOR MEASURING WEAK MAGNETIC FIELDS; J. L. Valente Da Cruz, Newcastle-Unon-Tyne, England. App. filed April 23, 1918.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

HERMON, ME.—The Black Stream Electric Company contemplates extending its transmission lines to Levant to furnish electrical service there.

PERHAM, ME. — The Public Utilities Commission has granted Charles O. Austin of Washburn permission to furnish electricity in Perham.

PORTLAND, ME. — The Cumberland County Power & Light Company has applied to the Public Utilities Commission for permission to issue $1,000,000 in bonds, the proceeds to be used for building a new steam-driven power station at South Portland.

SKOWHEGAN, ME.—Work has started on the new mill of the New Main Spinning Company on Skowhegan Island. The building will be three stories high, 82 ft. x 218 ft., and will be equipped with electric motor-driven machinery.

HYANNIS, MASS.—Arrangements have been made whereby a direct transmission line will be erected from Wareham to Buzzards Bay over which the New Bedford Gas & Edison Light Company will supply electricity to the Cape & Vineyard Electric Company at Cape Cod Canal.

WEYMOUTH, MASS. — The Weymouth Light & Power Company has applied to the State Department of Public Utilities for permission to issue $460,000 in capital stock, the proceeds to be used for extensions and improvements.

PROVIDENCE, R. I. — The Wanskuck Company will build a one-story power house at its Geneva textile mill.

NAUGATUCK, CONN.—Estimates of the cost of a new electric lighting system for Main, Maple and Church Streets have been submitted to the Chamber of Commerce by C. L. Campbell, secretary of the Waterbury division of the Connecticut Light & Power Company.

WALLINGFORD, CONN. — A special committee has been appointed to investigate the question of appropriating $30,000 to equip the municipal electric plant so that it could purchase electricity for distribution, or to appropriate $70,000 for new equipment to meet the increasing demand for electrical service.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by T. J. Drennan, Fire Commissioner, Municipal Building, New York City, until June 27 for constructing a portion of the underground fire-alarm system in Brooklyn.

COLLINS, N. Y.—The Seneca Transmission Company has applied to the Public Service Commission for permission to construct an electric lighting system in Collins. The company will acquire an existing station here.

MIDDLETOWN, N. Y.—The Public Service Commission has granted the Orange County Hydro-Electric Corporation permission to construct a hydro-electric plant on the Mongaup River. The company has also been authorized to furnish energy in Orange and Sullivan Counties.

NEW YORK, N. Y.—A power plant will be built in connection with the proposed municipal ship-repair plant on Staten Island, to cost about $500,000. Grover A. Whalen, Municipal Building, is commissioner, Department of Plants and Structures.

POUGHKEEPSIE, N. Y.—Plans are being prepared by the Adirondack & Southern Power Company for a double-circuit, three-phase, 60-cycle, 110,000-volt transmission line from Schenectady to Catskill, a distance of about 45 miles. O. H. Bundy, Poughkeepsie, is engineer.

POUGHKEEPSIE, N. Y. — The Public Service Commission has granted the United Hudson Electric Corporation permission to erect an electric transmission line through the towns of Athens, Coxsackie, New Baltimore and Coeymans. Permission has also been granted the Adirondack & Southern Power Company to build a line in the towns of Princeton, Voorheesville, Guilderland, New Scotland and Bethlehem. This transmission line is to connect the United Hudson Electric Corporation with the Adirondack Power & Light Corporation, Amsterdam, for the purpose of serving the Hudson River communities with additional power.

MILLBURN, N. J.—The Morris & Somerset Electric Company, Morristown, has applied to the Board of Public Utility Commissioners for permission to extend its transmission line from Boonton to Millburn, to furnish electricity to the Millburn Electric Light Company.

TRENTON, N. J.—The Department of Parks and Public Property will install a high candle-power lighting system on West State Street. Ornamental lamps will be used on a section of the thoroughfare.

BEDFORD, PA.—The Broad Top Power Company, recently organized, has been granted permission by the Public Service Commission to acquire and merge ten companies organized to operate in Bedford and Huntingdon Counties. Extensions and improvements will be made.

BRADFORD, PA.—The Niagara, Lockport & Ontario Power Company, Niagara Falls, N. Y., has applied to the Public Service Commission for permission to acquire the Bradford Electric Company.

GIRARDVILLE, PA.—Plans are under consideration by the J. S. Wentz Company, Land Title Building, Philadelphia, for equipping its local coal plant and colliery for electrical operation.

PHILADELPHIA, PA. — The Firth & Foster Company, Emerald and York Streets, will build an addition to the power house at its dye works.

ROCHESTER, PA.—The American Borax Company will build a power plant in connection with its proposed local factory, to cost $90,000. E. L. Dawes, care of the Standard Sanitary Manufacturing Company, Bessemer Building, Pittsburgh, is president.

WESTON, PA.—The Pennsylvania Power & Light Company, Allentown, will extend its transmission line to Weston and will install local distributing systems here and at Fern Glen and Rock Glen.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company has issued $10,000,000 in bonds, part of the proceeds to be used for extensions and improvements. Plans have been completed for the erection of an addition to the substation on West Pratt Street.

PATUXENT, MD.—The Patuxent Clay Products Company, Equitable Trust Building, Baltimore, will build a power house in connection with its proposed local plant, to cost about $100,000. I. P. Mills is in charge.

WELLSBURG, W. VA. — The Brooke Electric Company, the Wellsburg Electric Light, Heat & Power Company and the Hancock County Electric Company have been consolidated under the name of the Brooke Electric Company, which will furnish electricity for lamps and motors in Brooke and Hancock Counties.

CEDAR BLUFF, VA.—A power house will be built in connection with the proposed new local textile plant of the Clinch Valley Blanket Mills.

NEW MARKET, VA. — The Federal Power Commission has granted Edward T. Brown a preliminary permit to develop water power on Cub and Pitt Springs Run to furnish electricity for lighting Engless Caverns and the town of New Market.

SCOTTSVILLE, VA. — The Big Bend Power Company contemplates the construction of a hydro-electric power plant on the James River, with transmission system.

WASHINGTON, D. C.—Bids will be received by the Constructing Quartermaster, Room 2306 Munitions Building, until June 20 for improvements and repairs to the street-lighting system at the Washington barracks.

North Central States

DETROIT, MICH.—Parke, Davis & Company, 2951 Atwater Street, will build a one-story power house, 70 ft. x 100 ft., at their drug factory.

CLEVELAND, OHIO.—Plans are being prepared by the Power Improvement Company, Williamson Building, for altering and building a three-story factory addition at Cedar Avenue and Ashland Road, to cost about $350,000.

LATCHIE, OHIO.—Bids will be received by L. J. Lilje, clerk of the Board of Education, until June 23 for the construction of 1½ miles of pole line, transformers and other electrical equipment for service at the Lake Township Centralized School. Langdon, Hohly & Gram, Nicholas Building, Toledo, are architects.

SUGARCREEK, OHIO.—The Ohio Public Service Company, New Philadelphia, has

purchased the property of the Sugarcreek Electric Company. A transmission line will be constructed to Dover for connection with the Ohio system.

TOLEDO, OHIO. — The Toledo Edison Company, successor to the Toledo Railways & Light Company, has applied to the Public Utilities Commission for permission to issue $777,000 in bonds, the proceeds to be used for extensions and improvements.

LOUISVILLE, KY. — Plans are under consideration for the installation of ornamental lamps on Broadway from Second to Eleventh Street. The Louisville Gas & Electric Company has the contract for street-lighting service.

GREENFIELD, IND.—The Mutual Electric Lighting Company contemplates extensions to its transmission line on the Shelbyville Road.

APPLETON, WIS.—Bids are being taken by the Wisconsin Traction, Heat, Light & Power Company for the erection of a garage, service station and repair shop, to cost about $45,000. D. C. Beaulier is engineer.

DANE, WIS.—Bids are being asked by the Wisconsin Power, Light & Heat Company, Gay Building, Madison, for the erection of a 35-mile transmission line from Dane to Beaver Dam, with a substation at Columbus.

GRAVESVILLE, WIS. — The Calumet Service Company will extend its transmission line from Chilton to Gravesville and will install a local distributing system.

JANESVILLE, WIS. — The Janesville Electric Company has plans under way for a new substation. A transmission line will be erected to Edgerton.

NEENAH, WIS.—A power house will be built in connection with the proposed new mill of the Valley Paper Mills, Inc., in the Blair Springs district, to cost about $800,000. G. W. Burnside is secretary and general manager.

OSHKOSH, WIS. — The Oshkosh Gas Light Company contemplates improvements to its plant, to cost about $20,000; also the erection of a 4,000-volt transmission line to supply electricity to residences along the Doty Road.

BARNESVILLE, MINN.—Work will soon commence on the installation of a municipal electric distributing and street-lighting system. Charles L. Pillsbury Company, Minneapolis, Minn., is engineer.

VIRGINIA, MINN. — The Water and Light Commission has awarded a contract to Frederick Gorham, Virginia, for the erection of an addition to the municipal electric plant. A. T. Harding is engineer.

CEDAR RAPIDS, IOWA.—Negotiations are under way between the City Council and the Iowa Railway & Light Company for the installation of a new street-lighting system.

OSKALOOSA, IOWA. — Bonds to the amount of $300,000 have been voted for the construction of a municipal hydro-electric power plant on the Des Moines River, near Harvey.

CLINTON, MO. — The West Missouri Power Company is having plans prepared for a new power plant.

KIRKSVILLE, MO.—All bids submitted for additions and equipment to the power house at the Northeast Missouri State Teachers' College have been rejected. New bids will be asked for on revised plans. R. H. Sanneman, Lee Building, Kansas City, is architect.

SLATER, MO.—Improvements are contemplated to the municipal electric light plant, to cost about $25,000.

HURON, S. D.—Plans, it is reported, are under consideration to increase the output of the local electric light and power plant and install a new street-lighting system, to cost about $100,000. J. H. A. Brahtz, Metropolitan Opera House Building, St. Paul, Minn., is engineer.

LAWRENCE, NEB.—The Council will soon award a contract for the construction of a municipal transmision and distributing system, to cost $12,000. The Hollister Engineering Company, Bankers' Life Building, Lincoln, is engineer.

ANDALE, KAN.—Bids will be received by the City Clerk until June 20 for the construction of a transmission line from Andale to Wichita, Kan., a distance of about 20½ miles, and the installation of distributing systems at Andale, Colwich and Maize. The Ruckel Engineering Company, Hutchinson, is engineer.

ROSEDALE, KAN.—The Board of Administration, Topeka, will build a power plant, to cost about $50,000, in connection with the new local Bell Memorial Hospital. J. A. Kimball, business manager, is in charge.

Southern States

RALEIGH, N. C.—A. S. Partin will establish a small electric plant to serve a community in this section. Inquiries are being made for a generator and auxiliary electric equipment.

RAMSAUER, N. C.—The Columbia Manufacturing Company will build a steam-operated electric plant at its mill.

FLORENCE, S. C.—The Palmetto Power & Light Company contemplates improvements and extensions to its system to cost about $84,000. The work will include rebuilding and extension to the distribution system, installation of a 500-hp. boiler and cooling tower, etc. P. A. Tillery, Raleigh, N. C., is vice-president and general manager.

WEST POINT, GA.—Extensions and improvements to the municipal electric light plant are under consideration.

GAINESVILLE, FLA.—Bids will be received by the City Council until July 3 for construction of addition to the municipal electric light and water plant, including piping and wiring systems. Robert & Company, Inc., Red Cross Building, Atlanta, Ga., are engineers. G. H. Cairns is city manager.

MIAMI, FLA.—The Miami Mattress Company will build a power plant in connection with its new local factory. Richard M. Wells is head.

LAFAYETTE, LA.—J. C. Barry is negotiating for a lease of the municipal electric plant. A company will be organized to operate the property, and plant extensions and improvements will be made.

ZWOLLE, LA.—The Zwolle Mill & Light Company contemplates improvements to the local power plant, recently acquired from the Sabine Lumber Company.

CARTER, OKLA.—The Council will hold in temporary abeyance a special election to vote bonds for a municipal electric plant, estimated to cost $23,500. V. V. Long & Company, 1300 Colcord Building, Oklahoma City, Okla., are engineers.

LOCUST GROVE, OKLA.—Bids will be received by E. S. McCoy, town clerk, until June 28 for the construction of a 6-mile transmission line, 13,200-volt, three-phase, No. 6 bare copper wire; a step-down transformer station and complete distributing system, with street-lighting circuit. V. V. Long & Company, Colcord Building, Oklahoma City, are engineers.

OKEENE, OKLA.—Bids will be received by W. F. Wooten, city clerk, until July 5 for extensions and improvements to the municipal power plant, to cost about $40,000. Bids submitted June 1 have been rejected. V. V. Long & Company, Colcord Building, Oklahoma City, are engineers.

OKLAHOMA CITY, OKLA.—The Oklahoma General Power Company will build a 60,000-volt transmission line from its new generating plant at Muskogee to Oklahoma City and also to Fort Smith, Ark.

PAWNEE, OKLA.—Bids will soon be asked for extensions and improvements to the municipal electric plant, to cost about $65,000. The Benham Engineering Company, Kansas City, Mo., is engineer.

SHAWNEE, OKLA. — The Southern Oklahoma Power Company has issued $1,380,000 in bonds, part of the proceeds to be used for extensions and improvements.

TULSA, OKLA. — The Public Service Company has awarded a contract to the Midland Engineering & Construction Company, 332 South Michigan Avenue, Chicago, for the construction of a power plant of about 10,000 kw. capacity. Sargent & Lundy, 72 West Adams Street, Chicago, are engineers.

VIAN, OKLA. — The Oklahoma Gas & Electric Company has taken over the local electric plant and contemplates extensions and improvements.

AUSTIN, TEX.—Plans are being prepared for the erection of a new power plant at St. Edward's College, to cost about $40,000. A. W. Harris is architect.

Pacific and Mountain States

SPOKANE, WASH.—Tentative plans are under consideration by the Washington Water Power Company for the construction of a new hydro-electric plant at the lower Spokane Falls or rebuilding the present plant below the Monroe Street bridge.

TACOMA, WASH.—The Council has appropriated $29,000 for site investigations, plans and specifications for a municipal hydro-electric power plant on Lake Cushman.

ALBANY, ORE.—The Mountain States Power Company has made arrangements with the California-Oregon Power Company for the purchase of 12,000 kw. of electricity for distribution in the Willamette Valley, Oregon. Under the terms of the contract the California-Oregon company is to erect a 115-mile transmission line to connect its hydro-electric plant at Prospect, on the Rouge River with the substation of the Mountain States company at Springfield. The line is being built to operate at 110,000 volts. The Mountain States company is erecting interconnecting lines between its various divisions to operate in conjunction with the main line, which includes a 20-mile, 66,000-volt line to connect the Dallas district with the Albany district. An 11,000-volt line is being built to connect with the town of Jefferson. A third line will extend from Springfield to Cottage Grove.

PORTLAND, ORE.—The Pacific Power & Light Company has applied to the State Engineer for permission to appropriate 8,000 second-feet of water from the Snake River for power development in the States of Oregon, Washington and Idaho. The present plans provide for the construction of ten hydro-electric plants along the river in the above-named states.

PORTLAND, ORE.—The Federal Power Commission has granted the Northwestern Electric Company a permit for one year for a hydro-electric project on the Lewis River, about 35 miles from Portland. The project includes a dam 200 ft. high to create a storage reservoir of 200,000 acre-feet capacity. A power house will be built at the base of the dam to develop 20,000 kw. The proposed plant will be built near Yale, Wash., and will cost about $3,000,000.

DINUBA, CAL.—Bids will soon be asked for the installation of an electric lighting system, consisting of 325 metal lamp standards and about 40,000 ft. of conduit and cable. C. E. Sloan, Santa Fé Building, San Francisco, is engineer.

LOS ANGELES, CAL.—The Power Bureau has tentative plans under way for the construction of a municipal hydro-electric power plant on the south fork of the Kern River in Tulare County. Application has been made to the Federal Power Commission.

PASADENA, CAL.—The City Directors have adopted an ordinance for the installation of underground conduits in thirteen principal streets, including Euclid, Oak Knoll and El Molino Avenues.

VERNON, CAL.—The Wilson & Willard Manufacturing Company will build a power house at its oil-machinery plant.

DUCHESNE, UTAH.—The Uintah Power & Light Company is preparing to extend its transmission line from Lakeforth to Duchesne, a distance of 14 miles, to serve several large ranches in this section.

MILES CITY, MONT. — The Buffalo Rapids Hydro-Electric Company will build a hydro-electric plant on the Yellowstone River about 7 miles from Miles City. Permission has been granted by the Federal Power Commission.

VIRGINIA CITY, NEV. — The Truckee River General Electric Company is making surveys for the construction of a 60,000-volt transmission line to Comstock City.

Canada

VANCOUVER, B. C.—The construction of a hydro-electric power plant at the Ocean Falls sawmills of the Pacific Mills, Ltd., to cost about $500,000, including power dam, is under consideration.

HALIFAX, N. S.—The Premier Paper & Power Company, recently incorporated, has purchased the property of the H. Croix Paper & Lumber Company and is planning to construct a new paper mill and power plant, to cost about $1,500,000. The equipment will include two hydraulic turbines to generate about 3,300 hp., four waterwheels, etc. Phil H. Moore, 91 Hollis Street, is managing director, and George F. Hardy, 309 Broadway, New York City, is consulting engineer.

BELLE RIVER, ONT.—Plans are being prepared for the installation of an electric lighting and power distribution system, to cost about $35,000. E. D. Lawler, 190 University Avenue, Toronto, is engineer.

EUGENIA, ONT. — Three schemes for increasing the power service of the Eugenia branch of the Hydro-Electric system are said to be under consideration by the Hydro-Electric Power Commission of Ontario—linking up with the Niagara system, putting in a pipe line or developing the Saugeen River near Burgoyne.

OAKVILLE, ONT.—Tenders will be received by M. C. Irvine, secretary, Oakville Water & Light Commission, until June 22 for extension to pump house, including gasoline or oil engines, turbine pumps and electric generator. Chipman & Power, Toronto, are engineers.